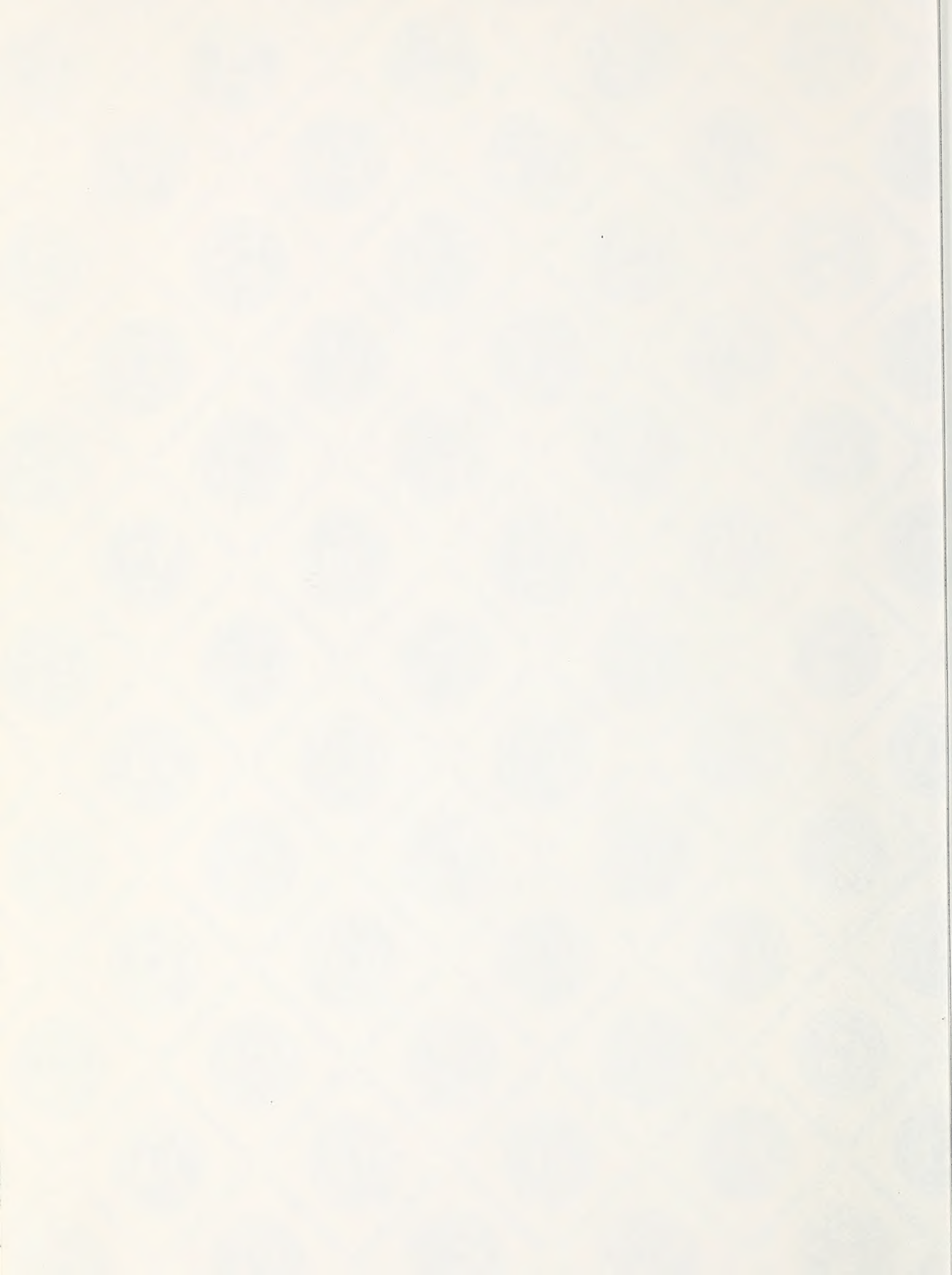


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The FOREST RESOURCES of KENTUCKY

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FOREST SERVICE RESOURCE BULLETIN NE-54
1978
FOREST SERVICE, U.S. DEPARTMENT OF AGRICULTURE
NORTHEASTERN FOREST EXPERIMENT STATION
370 REED ROAD, BROOMALL, PA. 19008

FOREWORD

UNDER THE AUTHORITY of the McSweeney-McNary Forest Research Act of May 22, 1928, as amended, and the Renewable Natural Resources Planning Act of 1974 as amended, the Forest Service of the U. S. Department of Agriculture, conducts periodic inventories and makes evaluations of the forest resources of all states to provide up-to-date information about the forest resources of the Nation.

The first forest inventory of Kentucky was made in 1949 by the Central States Forest Experiment Station. A second survey was conducted by the same unit in 1963.

The third survey was made in 1973, 1974, and 1975 by the Northeastern Forest Experiment Station. As in the previous surveys, the Forest Service had the cooperation of many individuals and agencies. Special thanks are due former State Forester Harry M. Nadler and the personnel of the Division of Forestry of the Kentucky Department for Natural Resources and Environmental Protection.

The third inventory of Kentucky was directed by Carl E. Mayer, Resources Evaluation unit Leader. Joseph E. Barnard was responsible for the design of the inventory and sample selection as well as for supervision of data compilation. John R. Peters supervised the aerial-photo interpretation and data collection by field crews. David R. Dickson applied the generalized data-processing system, FINSYS, to the specific data needs of the Kentucky inventory and produced summary tables for the State, geographic sampling units, and counties. Teresa M. Bowers assisted in the inventory design by performing all calculations necessary for sample-size determination and plot selection. She was responsible for the coordination of key punching and other data-preparation tasks, and the final preparation and statistical checking of tables for the report. James T. Bones, with the assistance of State personnel, collected and compiled the data on timber-products output and timber removals. He was assisted in the compilation phase by David R. Dickson and Teresa M. Bowers. Carmela M. Hyland was responsible for administrative and secretarial services.

Joseph E. Barnard and the senior author checked the consistency of the new inventory with previous inventories. They made frequent use of the TRAS (Timber Resource Analysis System) forest-stand simulation model in this phase of the data analysis and in the 30-year projections of timber volume.

The photo-interpretation phase of this inventory was completed in March 1975 and the last field plot was measured in November 1975. Final computer output was available in July 1976. Users of this report who need more detailed information should contact the Resources Evaluation unit, Northeastern Forest Experiment Station, 370 Reed Road, Broomall, Pa. 19008.

Users of this report are strongly advised to read carefully the definitions of forest-survey terms and the section on the reliability of the estimates in the appendix of this report.

THE AUTHORS

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The Forest Resources of Kentucky

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Kentucky Division of Forestry Photo.

Cover Photo: View from Pine Mountain State Park, Bell County.

ABSTRACT

The findings in this statistical and analytical report on the third forest survey of Kentucky, conducted in 1973, 1974, and 1975, are based on both remeasured and new 10-point cluster plots. The present status and trends in forest-land area, timber volume, and annual growth and removals are discussed. Timber-products output by forest industries, based upon a canvass of industries in 1974, and the importance of timber to the economy of the State are also discussed. The report includes a discussion of the outlook for timber supplies through 2004, and forest-management opportunities in the State. The status and importance of the nontimber forest resources of Kentucky are also discussed.

HIGHLIGHTS

- ★ Kentucky has 11.9 million acres of commercial forest land, 47 percent of its land area. This represents a small but steady increase since 1949.

- ★ One-half of the commercial forest land is in the eastern third of the State.

- ★ Ninety-two percent of the commercial forest land is owned by an estimated 455,600 private owners—261,000 own fewer than 10 acres. The average size of privately owned forest tracts is 24.2 acres.

- ★ Oak-hickory stands dominate—63 percent of the commercial forest-land area, and 69 percent of the growing-stock volume.

- ★ Growing-stock and sawtimber volume increased by 23 and 24 percent, respectively, since 1963.

- ★ Thirty percent of the hardwood sawtimber volume is grade-1 and -2 material—50 percent is grade 3.

- ★ In order of decreasing volume, white oak, black oak, and yellow-poplar are the most abundant species.

- ★ From 1962 to 1974, the growing-stock inventory increased by an average of 179.8 million cubic feet each year.

- ★ From 1962 to 1974, timber removals averaged only 38 percent of growth for the growing-stock inventory, and 49 percent for the sawtimber inventory. All species are growing faster than they are being cut.

- ★ The gap between growth and removals is expected to continue to widen through 2004.

- ★ Ownership patterns are seen as the biggest challenge to forest management in Kentucky.

- ★ Kentucky is blessed with a variety of nontimber forest resources that provide plentiful benefits to Kentuckians and nonresidents alike.

THE THIRD LOOK

IN 1949, the U.S. Forest Service with the cooperation of other state and federal agencies conducted the first in this series of periodic forest inventories of Kentucky (Hutchinson and Winters 1953). Fourteen years later, the second inventory was conducted (Gansner 1968). This third survey, some 12 years later, shows that the forest resources of Kentucky have continued to change.

This report is a statistical and analytical presentation of the results of this third survey; present timber resources and the changes that have taken place are examined. Trends in timber supply, landowner attitudes, and timber availability are discussed. Projections of future timber supply are made and discussed. Because timber is not all there is to a forest, many of the resources and benefits that are affected by forests or that affect the forest are also discussed.

Seven geographic units

To provide more meaningful regional information, Kentucky has been divided into seven geographic sampling units (Fig. 1). These units consists of groups of counties that are as similar in land characteristics as possible. These sampling units range from slightly more than 700,000 acres of commercial forest land to more than 2 million acres. Because these sampling units are the same

as those used in the previous inventory, comparisons of trends in the forest resource can be made for portions of the State.

Eastern Unit

8 Counties

LAND AREA: 2,134,500 acres

COMMERCIAL FOREST: 88 percent

POPULATION: 218,895¹

RURAL POPULATION: 90 percent¹

POPULATION DENSITY: 66 per square mile¹

PER CAPITA INCOME: \$1,534²

This unit contains some of the most important coal-producing counties in Kentucky, yet it is the most forested of the seven units. This region is the heartland of the Appalachians in Kentucky.

Northern Cumberland Unit

13 Counties

LAND AREA: 2,495,900 acres

COMMERCIAL FOREST: 74 percent

POPULATION: 206,866¹

RURAL POPULATION: 69 percent¹

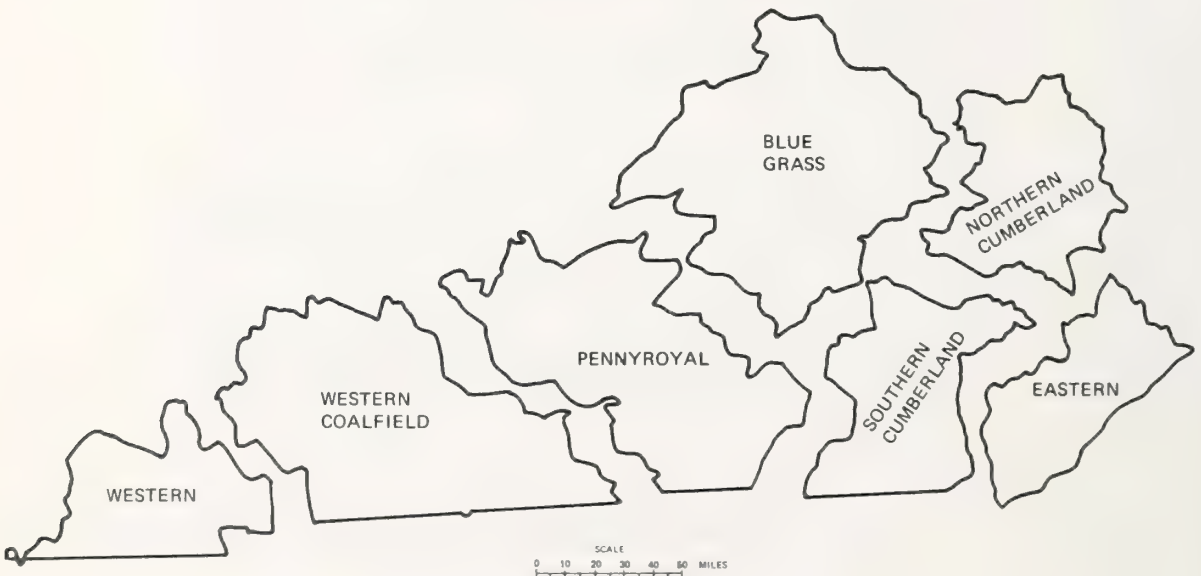
POPULATION DENSITY: 53 per square mile¹

PER CAPITA INCOME: \$1,987²

¹ U.S. Bureau of the Census 1971.

² U.S. Bureau of the Census 1972.

Figure 1.—Geographic units of Kentucky.



This is the northern portion of the Cumberland Plateau in Kentucky. This is a rural area with steep slopes and narrow valleys poorly suited to agriculture.

Southern Cumberland Unit

12 Counties

LAND AREA: 2,782,600 acres

COMMERCIAL FOREST: 78 percent

POPULATION: 198,229¹

RURAL POPULATION: 82 percent¹

POPULATION DENSITY: 46 per square mile¹

PER CAPITA INCOME: \$1,398²

This is the southern portion of the Cumberland Plateau in Kentucky. One of the most rural regions, it also has the lowest population density and the lowest per capita income. Many of this region's counties contain important coal deposits.

Bluegrass Unit

36 Counties

LAND AREA: 5,641,800 acres

COMMERCIAL FOREST LAND: 24 percent

POPULATION: 1,551,778¹

RURAL POPULATION: 25 percent¹

POPULATION DENSITY: 176 per square mile¹

PER CAPITA INCOME: \$3,043²

This region is named for the well-known grass that occurs naturally in the area. Its botanical name (*Poa pratensis* L.) means literally "grass of the meadows". This is, indeed, a region of grassy meadows. Because of the area's generally fertile soils and gentle rolling terrain, most of the original forest has long since been cleared for agriculture. Tobacco and thoroughbred horses are synonymous with the Bluegrass region. This is the most affluent and densely populated unit in the State, and the least forested.

Pennyroyal Unit

20 Counties

LAND AREA: 4,780,700 acres

COMMERCIAL FOREST LAND: 45 percent

POPULATION: 363,163¹

RURAL POPULATION: 71 percent¹

POPULATION DENSITY: 49 per square mile¹

PER CAPITA INCOME: \$1,926²

This unit is named for the Pennyroyal of America (*Hedeoma pulegioides*), a wild member of the mint family that grows abundantly in this region.

This area is well drained and it has depressions and caverns where the underlying limestone deposits have been dissolved. Relatively drier soils and hilly terrain make this region unsuitable for highly productive agriculture.

Western Coalfield Unit

20 Counties

LAND AREA: 5,478,500 acres

COMMERCIAL FOREST LAND: 34 percent

POPULATION: 490,626¹

RURAL POPULATION: 55 percent¹

POPULATION DENSITY: 57 per square mile¹

PER CAPITA INCOME: \$2,225²

This area encompasses the western coalfields of Kentucky. The region also contains petroleum and other mineral deposits. Farming is extensive in this region as the soils are generally fertile, and the terrain is more gentle than most regions to the east.

Western Unit

11 Counties

LAND AREA: 2,190,800 acres

COMMERCIAL FOREST LAND: 32 percent

POPULATION: 189,148¹

RURAL POPULATION: 63 percent¹

POPULATION DENSITY: 55 per square mile¹

PER CAPITA INCOME: \$2,401²

This is a gently rolling agricultural region. In the far western portion of the unit are rich bottomlands along the Mississippi River.

Comparisons between inventories

Through the years, many definitions, procedures, and methods have changed because of improved forest-inventory and data-processing techniques. This means that to analyze actual trends between forest surveys, the estimates from the previous survey must be on a comparable basis with the current survey. This procedure pinpoints the sources of inconsistency in the data that may be the result of differences in procedures or definitions between inventories. In the case of Kentucky, it was found that the average tree volume by 2-inch diameter classes was the major area of discrepancy between the 1963 and 1975 inventories. The volume table used in 1963 was more conservative than all others tested. When the 1963 stand-table data were used with average tree volumes from the 1975 inventory, the adjusted 1963

estimates of volume were consistent with the estimates of growth and removals during the 1963-1975 period. The following adjusted estimates of 1963 growing stock and sawtimber are used throughout this report for comparison purposes:

	CHANGE IN AREA AND VOLUME 1949-75			Change 1963-75
	1949	1963	1975	
Commercial forest land: (thousand acres)	11,446.0	11,712.8	11,901.9	+ 189.1
Growing-stock volume: (million cubic feet)				
Softwoods	457.1	613.0	862.5	+ 249.5
Hardwoods	7,279.2	8,673.4	10,581.2	+ 1,907.8
Total	7,736.3	9,286.4	11,443.7	+ 2,157.3
Sawtimber volume: (million board feet)				
Softwoods	1,077	1,413	1,967	+ 554
Hardwoods	17,315	20,841	25,585	+ 4,744
Total	18,392	22,254	27,552	+ 5,298

HISTORICAL BACKGROUND

Kentucky, the "dark and bloody ground" of centuries of internecine wars among Choctaw, Shawnee, and Cherokee, was once nearly all a dense forest. It is believed that of the 26 million acres of land in Kentucky more than 24 million were densely forested, often with legendary giants (Collins 1975).

Early accounts by Thomas Chrittenden Cherry stated that "the giant forests of oak and tulip, beech and ash, sycamore and linden (basswood), cedar and pine, and many other varieties of trees grow so close that their leafy branches spread a canopy through which the rays of the sun could scarcely penetrate, producing twilight effects even at high noon" (Collins 1975).

By the 1760's, the first white men were crossing the Appalachians to settle in Kentucky. Most moved west of the mountains into the more gently rolling Bluegrass and Pennyroyal regions. These were the legendary frontiersmen and adventurers. Later the mountains would be settled by others, equally colorful but less schooled in the ways of woodland life. These were the orphans, debtors, social outcasts, even criminals, who had been brought from the overcrowded, pestilence-ridden cities and larger towns of Britain as indentured

labor for the plantations of Virginia and the Carolinas (Caudill 1962). Having worked their term of indenture but still penniless, these settlers moved into the hills and hollows of the Appalachians. Here they could have land for the taking and need not live in the shadow of an affluent landed gentry.

To the early settlers of Kentucky, these dense forests were an obstacle and a hindrance. Land had to be cleared for homesteads and farms. Timber was sometimes burned to provide potash for fertilizer; more often it was burned to get rid of it. Many settlers had little knowledge of even basic farming techniques. They made mistakes. They built their cabins on the flatlands near streams, often the most suitable land for farming. They cleared the hillsides for fields and turned their livestock loose in the woods. The result was erosion, declining crop yields, and subsistence farming.

For years the mountaineer had seen the timber around him as a source of heat, housing, and a little income. After the Civil War, the timber in the Kentucky hills caught the eye of northern and eastern speculators. Corporations were organized to purchase and speculate in east Kentucky timber. Some of the corporations sent lawyers into the hill counties, where they found vague or non-

existent land titles. Often by merely filing a legal deed or claim, these corporations were able to acquire land from under the feet of the mountaineers (Caudill 1962).

Logging boomed in the hills. By 1870 Kentucky produced 217 million board feet of timber. The State ranked fifteenth in total production but near the top in hardwood production. By 1907, total production peaked at 913 million board feet, and the industry employed an estimated 30,000 people (Widner 1968). During this era large trees were often felled for only one log. The remainder of the tree was left to rot or burn, and little if any thought was given to the land or the next crop. Wildfire and erosion ravaged the land. By 1925 the boom became a bust—only 10,000 people were employed in a lumber industry that produced only 207 million board feet (Widner 1968).

The development of the coal industry was now well along, and again the hill folk were bamboozled. Few had any idea of the value of the coal seams that ran through the hills. For what seemed to them a large sum they signed the “broad-form deed” that gave to others not only the coal, oil, gas, and all mineral and metallic substances and “all combinations of the same,” but also the right to build roads, cut timber, and do whatever else was “convenient and necessary” to extract the minerals (Caudill 1962). Without realizing what he had done, the mountaineer had given the coal

interests a free hand to get at the mineral wealth of the hills.

Today, the forests of Kentucky, still beautiful but less majestic and often scarred, are slowly recovering from this double-barreled assault.

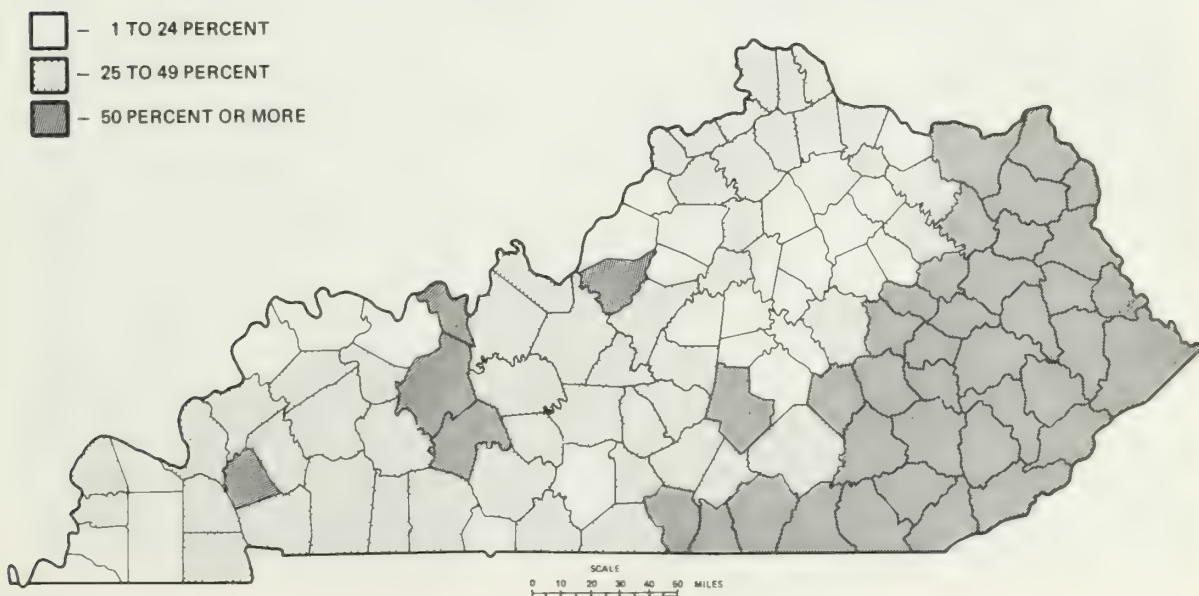
FOREST AREA

Forests now cover almost 48 percent of the land area of Kentucky—a total of 12,160,800 acres. Of this, 11,901,900 acres or 47 percent of the land area is classed as commercial forest land. This is land that is producing or is capable of producing crops of wood, and is not withdrawn from timber utilization by statute or administrative order.

Total forest area has increased by 3 percent since the last survey in 1963, and by 6 percent since the first survey in 1949. The area of commercial forest land has not increased as much, only by 2 percent since 1963 and by 4 percent since 1949. Productive reserved forest land increased by 164 percent. In 1963, only 80,700 acres were in this category, in 1975, there were 212,800 acres. Most of this increase is the result of thousands of acres of reservoirs that have been built since the last survey, especially in the Pennyroyal Unit.

Commercial forest land is not distributed evenly throughout the State. The percentage of commercial forest land ranges from a low of 5 percent in both Bourbon and Fayette Counties to a high of 94 percent in Leslie County. The most heavily for-

Figure 2.—Percentage of commercial forest land, by county, Kentucky, 1975.



ested part of Kentucky is in the eastern three geographic units which include part of the rugged Appalachians and all of the Daniel Boone National Forest. The average amount of commercial forest land for this section is 79 percent. The average for the rest of the State is only 33 percent. Figure 2 shows the general distribution of commercial forest land.

While the change in commercial forest-land acreage amounted to a relatively small 2-percent increase statewide, there was a dramatic 18-percent increase in the Bluegrass Unit between inventories. This large change resulted primarily from the abandonment of marginal farmland. Most of this "new" commercial forest land is in seedling- and sapling-size stands.

The Eastern Unit also showed a sizeable increase in commercial forest-land acreage—5 percent since 1963. This change also is attributed to abandonment of small marginal farms in the mountainous section of Kentucky. All of the other units showed increases or decreases of about 2 percent or less.

Forest-land ownership

Private ownership accounts for 92 percent of the commercial forest land in Kentucky. Only 895,300 acres are publicly owned. Of this, 818,700 are in Federal ownership. The Daniel Boone National Forest accounts for 588,800 acres and other Federal agencies hold 229,900.

The 11 million acres that are not publicly owned are in the hands of an estimated 455,600 private owners—including 427,200 individuals; 16,300 undivided estates; 8,400 partnerships; 2,600 corporations, and 1,100 clubs, youth organizations, churches, and similar associations. The average size of a privately owned tract of commercial forest land is only 24.2 acres, but these tracts range in size from 1 acre to as much as 100,000 acres. While 57 percent of private owners hold fewer than 10 acres of forest land, they account for only 7 percent—805,900 acres—of the total commercial forest-land base.

Of the 427,200 individuals who own commercial forest land in Kentucky, 107,600—25 percent—are farmers. Besides being the largest group of individual owners, they hold the most commercial forest acreage—3,141,100—35 percent—of any one group of people. Retired individuals are the next largest group, numbering

100,200—23 percent—and holding 1,952,900 acres of commercial forest land.

Of the 2,600 corporate owners, 1,000 are in industries not oriented toward forest production, such as coal and steel. These companies account for 602,900 acres of commercial forest land, which is 59 percent of all corporate holdings. Non-production, service-oriented companies number 900 or 35 percent of all corporate owners, but these companies hold only 102,700 acres or 10 percent of the corporate forest land. There are only 100 forest-industry corporations in Kentucky that own forest land, but they account for 107,900 acres of commercial forest land.

These estimates of numbers of owners and the amount of commercial forest land they own are based on the responses to a questionnaire that was sent to a random sample of forest owners in Kentucky. The results of this study will be published separately.

One of the primary objectives of this study was to estimate the volume of timber on privately owned commercial forest land that is now or may be available for timber harvesting. Thirty percent of the private forest-land owners in Kentucky have harvested timber from their land. While this may seem to be a fairly small number, it is important to note that these owners control 54 percent of the privately owned commercial forest land. Most of the owners of unharvested land have not harvested their timber because it is immature or of poor quality. Few owners reported that they have not harvested because they are opposed to harvesting.

Only 3 percent of the woodland owners cited timber production as their primary reason for owning forest land. These individuals control 940,000 acres or 9 percent of the forest land owned by the private sector. Not surprisingly, the reasons given most often for owning forest land were farm related—that is, the woods were part of the farm and served no useful function in the farm operation, or were sources of forest products for farm use, such as fenceposts, firewood, or rough lumber.

One of the more interesting facts determined in this ownership study is the tremendous number of people or corporations owning relatively small tracts of woodland. Eighty-eight percent—401,300 nonpublic owners—own fewer than 50 acres of woodland. This fact alone would create many problems for timber management, however only 35 percent—or 3,955,900 acres—of the

commercial forest land in Kentucky is held by these small-woodland owners. Thus the economic benefits derived from managing larger tracts can still be realized in many situations.

Forest types

Forest type classifications and definitions used in this survey differ in several respects from those used in the surveys of 1949 and 1963. Because of these differences, we are unable to compare acres of the forest types between surveys. Our discussion, therefore, will be based on data collected from this most recent survey.

Twenty-five forest types were recognized in this resurvey. These were assigned to seven major type groups that are recognized nationally by Resources Evaluation (see Table 10 in the appendix). Some groups are made up of only a small number of types in Kentucky. For example, the only type

in the white and red pine group in Kentucky is hemlock. Other groups are made up of several types. The oak/hickory group is a good example; it is composed of eight types. Figure 3 gives a breakdown of the commercial forest-land area by the major forest type groups.

Oak/hickory. The oak/hickory group dominates every section of the State. A total of 7.5 million acres—63 percent—of commercial forest land is occupied by this group. Two forest types—white oak/red oak/hickory and mixed hardwoods—predominate, each containing about 2 million acres. Either type alone has more acreage than any one of the six other major groups. In fact, the combined acreage of these two types—4,006,900—approaches the combined acreage of the six other major groups—4,413,400.

Maple/beech/birch. This valuable northern

Oak-hickory stands dominate Kentucky's forests.



Kentucky Division of Forestry Photo.

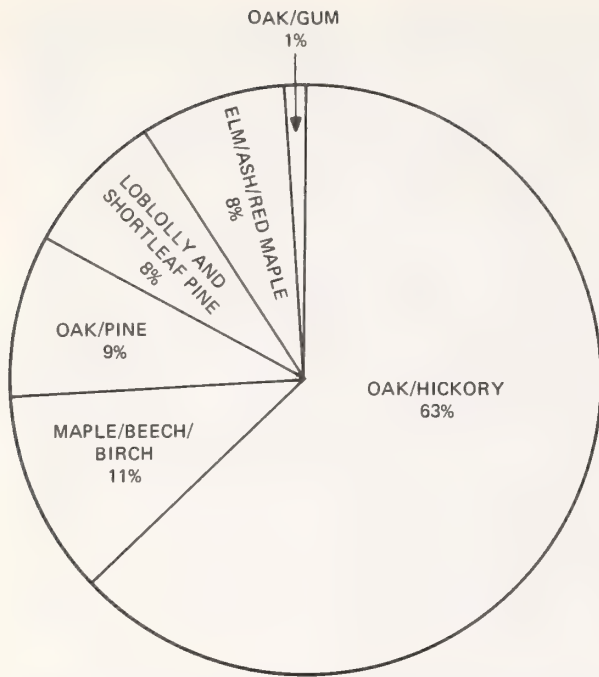


Figure 3.—Percentage of commercial forest-land area, by major forest type group, Kentucky, 1975. (White and red pine type group amounts to less than 1 percent.)

hardwood group is also found in all parts of the State, but is concentrated in eastern Kentucky. This group accounts for 11 percent of the commercial forest land. Its 1,354,200 acres can be broken down into three types: sugar maple/beech/yellow birch with 1,316,600 acres, black cherry with 23,000 acres, and black walnut with 14,600 acres. These last two types were distinguished because of their particularly high value to the sawtimber industry.

Oak/pine. This group, covering 1,040,600 acres of the commercial forest land of Kentucky—9 percent—occurs throughout the State but is found mainly in the east-central region. A substantial component of this group is the eastern redcedar/hardwood type—470,500 acres. Other types in this group are Virginia pine/southern red oak with 282,200 acres, shortleaf pine/oak with 183,300 acres, and other oak/pine with 104,600 acres.

Loblolly and shortleaf pine. This group in Kentucky contains no loblolly pine, but its 942,800 acres can be broken down into four other softwood types: eastern redcedar with 428,100 acres,

Virginia pine with 299,200 acres, shortleaf pine with 167,700 acres, and pitch pine with 47,800 acres. These softwood types are an esthetic bonus in many areas during the dormant season; they add welcome color to an otherwise dreary landscape.

Elm/ash/red maple. This group, covering 936,000 acres—8 percent—of the commercial forest land, is dominated by red maple, as evidenced by the 789,300 acres in the black ash/American elm/red maple type. The two other types are river birch/sycamore with 113,100 acres, and willow with 33,600. These two types are bottomland hardwood types commonly found along rivers and streams; they are generally of little commercial value.

Oak/gum. With the exception of a little acreage in the Eastern Unit, most of the 101,600 acres in this group are found in the western three units. The type is made up of two types in Kentucky—sweetbay/swamp tupelo/red maple and swamp chestnut oak/cherrybark oak. These types are common to the moister sites of the southern United States.

White and red pine. All of the 38,200 acres of this group are in the hemlock type, and are limited to the eastern three units. This type is scattered and is usually found in cool locations, moist ravines, and north-facing slopes.

Stand-size classes

The breakdown of commercial forest-land acreage by the size of the timber, or stand size, has changed little since the last survey. Currently, the State has 5.5 million acres in sawtimber stands, 3 million acres in poletimber stands, and 3.4 million acres in seedling-and-sapling stands, including 46,200 acres in nonstocked areas. This means that 47 percent of the commercial forest land is in sawtimber stands, 25 percent in poletimber stands, and 28 percent in seedling-and-sapling stands. These proportions are nearly the same as in 1963, indicating a stable timber-resource base in the State.

When the stand-size data are analyzed by major forest type group, there are some significant differences. Of the acreage in the loblolly and shortleaf pine group, 30 percent is in sawtimber stands, 17 percent is in poletimber stands, and 53 percent is in seedling-and-sapling stands. The high percentage for seedling-and-sapling stands is probably due to colonization of abandoned farmland

by eastern redcedar and Virginia pine, two common pioneer species in this region.

Another group with a higher percentage of its acreage in seedling-and-sapling stands is elm/ash/red maple. This is because red maple is very abundant at the seedling-and-sapling stage of its life cycle. As it ages, other species crowd out the maple, and through succession, the stand, as it grows to poletimber or small-sawtimber size, becomes another forest type.

The oak/pine group also has a preponderance of seedling-and-sapling stands—47 percent. As with the loblolly and shortleaf pine group, this is attributed to invasion by intolerant softwood and hardwood species of abandoned farmland. Eastern redcedar again plays a major role in the heavy proportion of young stands in this group.

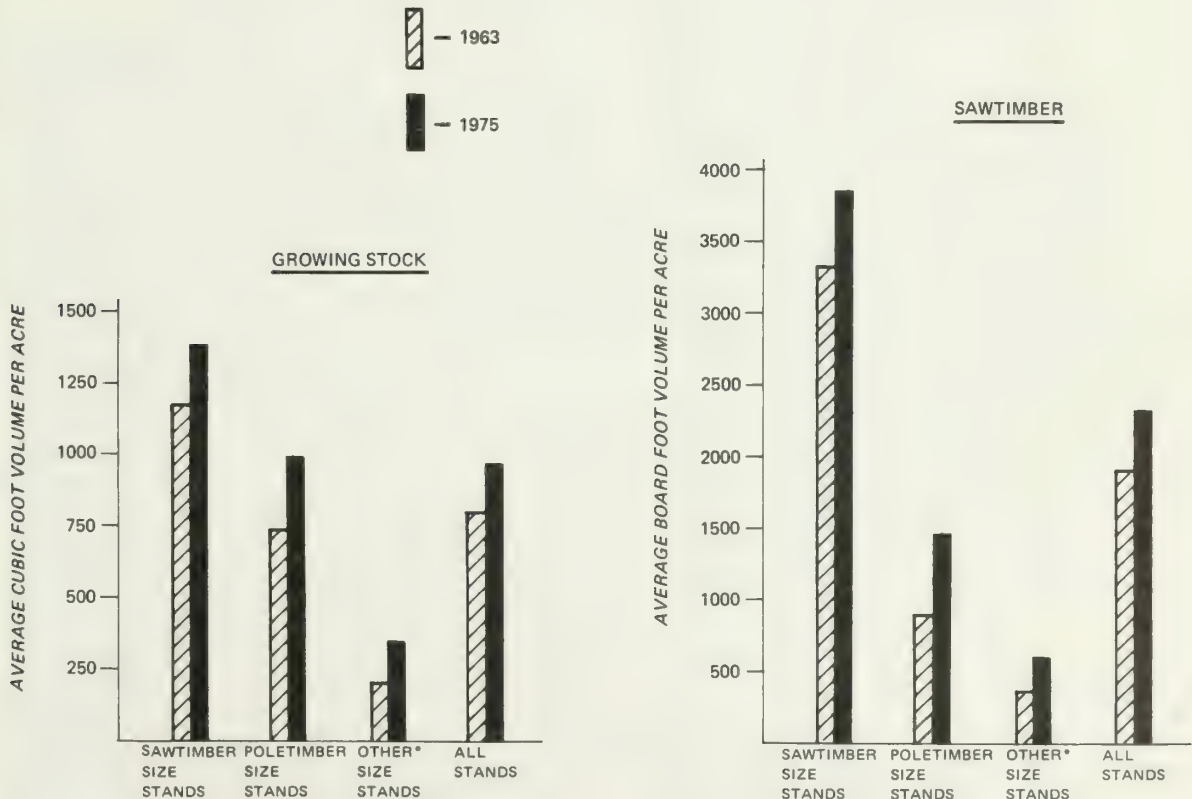
The situation in the maple/beech/birch group is quite different. Here 68 percent of the acreage is in sawtimber stands, with only 16 percent in poletimber stands, and 16 percent in seedling-and-sapling

stands. This proportion reflects the fact that sugar maple and beech are very shade tolerant species and tend to dominate a stand in the later stages of succession.

TIMBER VOLUME

Though the area of commercial forest land in Kentucky increased by only 2 percent from 1963 to 1975, the volume of growing stock increased by 23 percent. This increase is due to several factors. One is that growth has exceeded removals by a wide margin between inventories. Another reason is that with a relatively limited market for timber less than sawlog size in the heavily forested sections of the State, stands generally are allowed to reach sawtimber size before any cutting is done. Thus stands that were in the seedling-and-sapling stage in 1963 are now pole-size stands. This ingrowth has increased the standing volume of the woodlands in Kentucky substantially. Also, many

Figure 4.—Average volume per acre for growing stock and sawtimber, by timber size class, for 1963 and 1975, Kentucky.



*OTHER SIZE STANDS IS A COMBINATION OF SEEDLING, SAPLING, AND NONSTOCKED STANDS

of the pole-size trees measured for the 1975 inventory are still in the pole size class (5.0 to 10.9 inches in diameter at breast height (dbh) for hardwoods), or are in the small sawtimber class and have not been harvested.

Since volume has increased much more than commercial forest area, volume per acre has also increased. In 1963, the average acre of commercial forest land had 793 cubic feet of growing stock or 1,900 board feet of sawtimber. By 1975, the averages had risen to 962 cubic feet and 2,315 board feet, increases of 21 and 22 percent, respectively. Figure 4 shows how these figures for average volume per acre have changed by various timber size classes.

The total net volume of growing-stock trees in Kentucky is 11.4 billion cubic feet, compared to 9.3 billion in 1963. More than 92 percent of this volume is in hardwood species. There are only 863 million cubic feet of softwoods, and 75 percent of this volume is found in the eastern three units. In addition, there are about 1.2 billion cubic feet of merchantable volume that can be recovered from rough or rotten cull trees. There are 743 million net cubic feet in rough trees too crooked or misshapen to be considered growing stock. There are also 428 million cubic feet of sound wood in trees that contain too much rot to be classed as growing stock. In Kentucky, about 16 percent of trees larger than 5.0 inches in dbh are rough or rotten. In the past, harvesting sound volume in cull trees has been uneconomic. But whole-tree harvesting equipment and other improvements in logging and wood utilization have made it possible for more and more of this merchantable volume in heretofore unmerchantable trees to find its way out of the woods and into forest products.

Sawtimber volume has increased by 24 percent since 1963. The volume in 1975 was 27.6 billion board feet. It has been estimated that in the mid-1700's, when Kentucky was more than 93 percent forested, the total volume of the State probably exceeded 250 billion board feet (Collins 1975). These figures, once again, show us the tremendous impact that man has had on the forest resources of Kentucky.

Sawlog quality

Sawlog quality is very important because the difference in value between high- and low-quality logs can amount to several hundred dollars for equal volumes of the same species. So when the

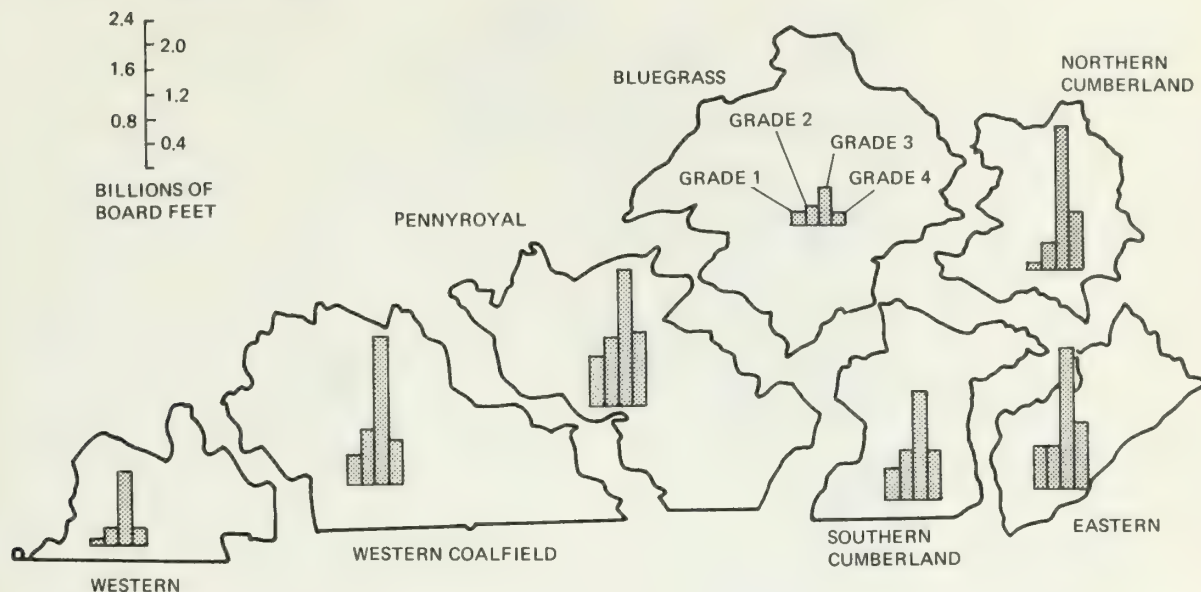
timber resource of a state is surveyed, log grades are assigned to all sawtimber-size trees on the basis of dbh, percent cull, and surface defects. Since nearly all of the sawtimber volume of Kentucky is in hardwood species, this discussion will center on hardwood log grades.

We use four log grades, the first three of which are factory grades; the fourth is a construction grade. Factory grade logs are suitable to be sawn into graded lumber. Grade-1 logs generally yield at least 70 percent No. 1 common boards or better; grade-2 logs yield at least 50 percent, and grade-3 logs yield at least 25 percent. Some grade-1 material is suitable for veneer, but most of it is used in furniture. Grade-2 logs may be used in furniture, and dimension and flooring, and some volume is used in lower quality products such as pallets. Grade-3 logs are used in products such as dimension and flooring, pallets, and upholstered furniture. Grade-4 logs (construction or tie and timber logs) are suitable for products requiring strength of piece, such as ties and heavy timbers. Other products derived from these logs include structural wood joists, planks, beams, stringers, and posts. Logs that do not meet the specifications of these four grades are considered cull logs.

Kentucky now has 7.5 billion board feet of hardwood sawtimber volume in grades 1 and 2. This amounts to 30 percent of the hardwood volume, which is a drop from the 1963 inventory. The decrease may be due to "high-grade" logging practices, where the better material is cut and the lower quality material is left. The hardwood volume in grade 3 is 12.8 billion board feet, which makes up 50 percent of the total hardwood volume. This is by far the most common log grade in Kentucky. Tie and timber logs are a distant second with 5.2 billion board feet, or 20 percent of the hardwood sawtimber volume.

The distribution of quality hardwoods in Kentucky is not uniform (Fig. 5). The Pennyroyal Unit has the best quality hardwood stands. This unit contains 20 percent of the hardwood sawtimber volume but 27 percent of all grade-1 volume and 23 percent of all grade-2 volume in the State. Within the unit itself, 36 percent of the hardwood sawtimber volume is grade 1 or 2. The Northern Cumberland Unit has the lowest proportion of high-quality hardwoods, containing 15 percent of the hardwood volume but only 4 percent of the grade-1 volume and 10 percent of the grade-2 volume. Within the unit, only 15 percent of the

Figure 5.—Hardwood sawtimber volume, by log grade and geographic unit, Kentucky, 1975.



hardwood sawtimber can be classed as grade 1 or 2.

Volume by species

Kentucky is typical of the eastern hardwood forest region; it has many species that vary in site requirements, value, and occurrence. To consider hardwoods as a single group would give an inadequate account of the hardwood timber resource in the State. A breakdown of hardwoods into seven species groups provides a better idea of the timber resource. Figures 6 and 7 show how growing-stock and sawtimber volumes of these species groups (and of an eighth group for softwood) have changed over a period of 26 years. Figure 8 gives a breakdown of the growing-stock volume by species group.

White oaks. This group is made up primarily of white oak (54 percent), chestnut oak (33 percent), and post oak (9 percent). White oaks account for 23 percent of the growing stock and 24 percent of the sawtimber volumes. In 1975, the growing-stock volume for the white oak group was 2.6 billion cubic feet—an increase of 525 million cubic feet since 1963. The sawtimber volume of white oaks was 6.6 billion board feet in 1975. Sawtimber volume for white oaks increased by 1.8 billion board feet since 1963—a 39-percent rise. This in-

crease was far greater than that for any other species group.

White oaks dominate the growing stock of all geographic units except in the Eastern Unit, where red oaks are more plentiful. The heaviest concentration of white oaks is in the Pennyroyal and Northern Cumberland Units—42 percent of the growing stock. These units, along with the Western Coalfield, Southern Cumberland, and Eastern Units, account for 88 percent of the growing-stock and sawtimber volumes.

The predominance of white oaks in Kentucky is due to many factors. First, the State is located in the center of the white oak range, on the southern edge of the chestnut oak range, and on the northern edge of the post oak range. Because of this overlap, white oaks are more abundant in Kentucky than they are in most neighboring states. Second, since white oak is the most prominent oak of the eastern deciduous forest, and since Kentucky is in the heart of this forest, white oak achieves its maximum development here. White oak, within the oak-hickory forest type, can be found on nearly all sites—from ridges to lower slopes. It is a very adaptable species and grows well under a variety of conditions. Chestnut and post oaks are generally found on drier slopes, or areas of greater environmental stress. These two species fill certain niches where white oak may not

Figure 6.—Growing-stock volume, by species group, Kentucky, 1949, 1963, 1975.

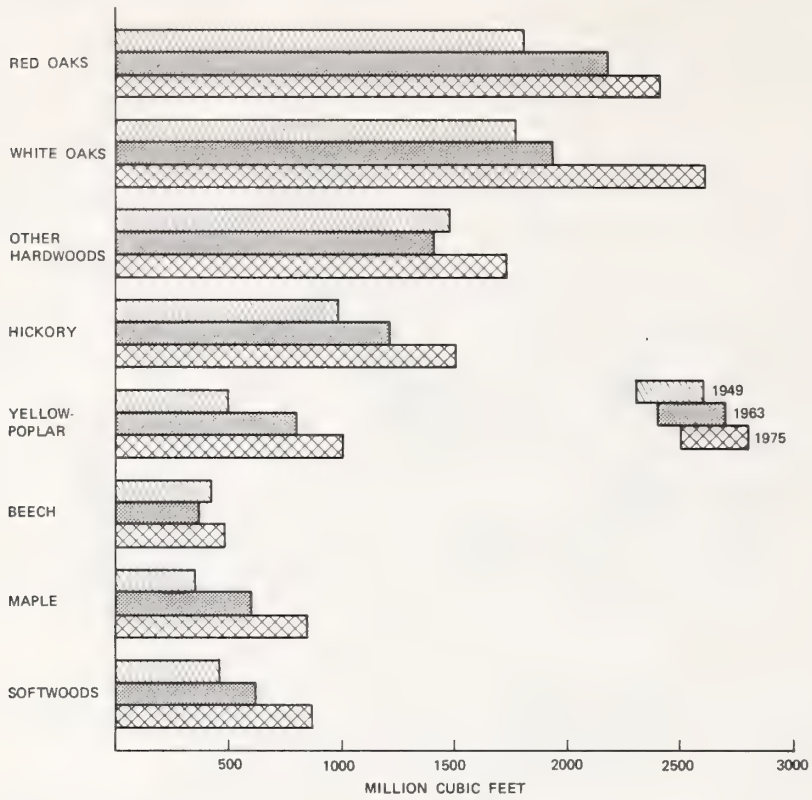


Figure 7.—Sawtimber volume, by species group, Kentucky, 1949, 1963, 1975.

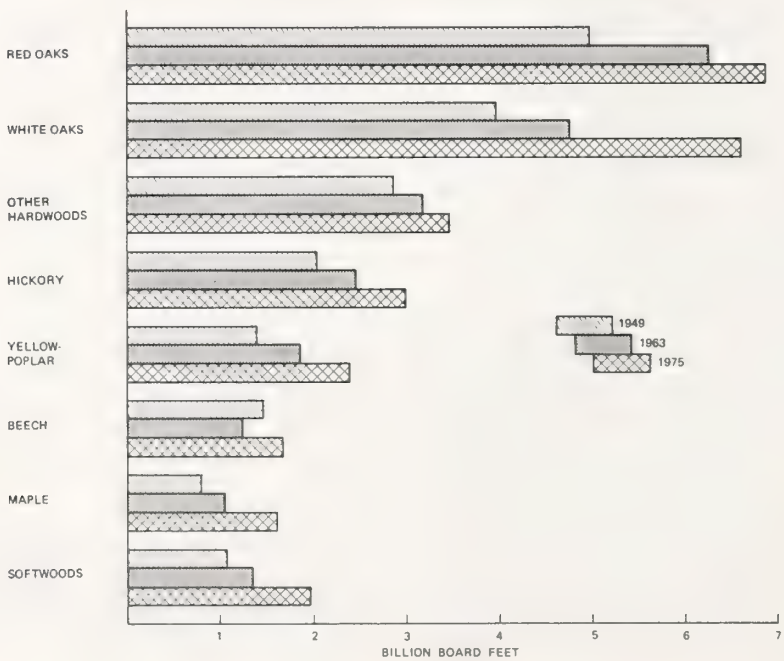
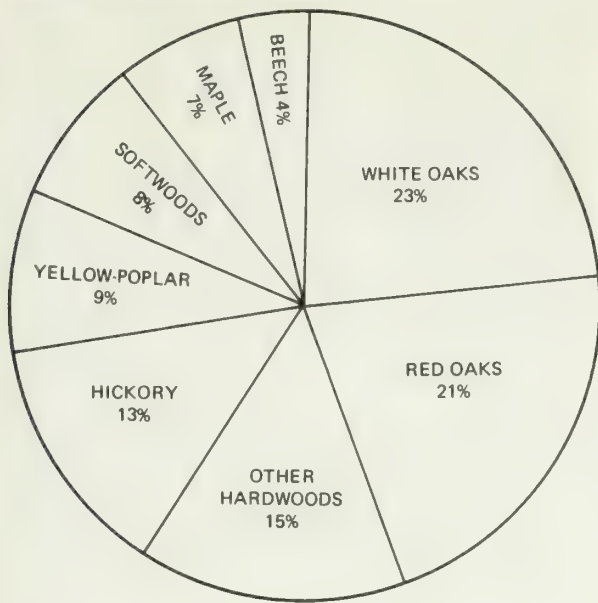


Figure 8.—Percent growing-stock volume, by species group, Kentucky, 1975.



be as competitive. So, because of the climate and location of Kentucky, as well as the diverse habitats occupied by the white oaks, this species group is an important part of the timber resource of the State.

Red oaks. The major species of this group are black oak (43 percent), northern red oak (24 percent), and scarlet oak (22 percent). With a growing-stock volume of 2.4 billion cubic feet, the red oaks rank second to the white oaks. In sawtimber volume, red oaks rank first with 6.9 billion board feet. Since 1963, the growing-stock volume of the red oaks has increased by 9 percent, and sawtimber volume has increased by 11 percent. With one exception—other hardwood sawtimber—these are the smallest increases of all eight species groups.

There are two reasons for these small increases in volume, and they both relate to a relatively high demand for red oaks. The first is that red oaks represent 33 percent of the sawlog production of Kentucky, yet they account for only 25 percent of the sawtimber inventory of the State. So the red oaks are taking on more than their share of the sawlog production, and thus have not been able to increase in volume as much as the other species. The second reason is that red oak has become a popular veneer species; 12 percent of the 1974 ve-

neer production was in red oak (Bones and Lohr 1977).

The red oaks are well distributed over five units in Kentucky: Western Coalfield, Pennyroyal, Northern and Southern Cumberland, and Eastern. These units account for 88 percent of both the growing-stock and sawtimber volumes of the red oaks. In growing stock, the red oaks follow the white oaks in volume in all units except the Eastern Unit. In sawtimber volume, however, the red oaks lead the white oaks in all units except Pennyroyal and Bluegrass. The red oaks and white oaks combined account for nearly one-half of the timber resource of Kentucky.

Other hardwoods. This species group represents all hardwood species excluding oak, hickory, yellow-poplar, maple, and beech. The group includes species such as ash, walnut, black cherry, basswood, sweetgum, blackgum, and elm. None of the species in this group has enough volume to consider separately, but together they account for 1.7 billion cubic feet or 15 percent of the growing-stock volume, and 3.4 billion board feet or 12 percent of the sawtimber volume.

The volume of growing-stock increased by 17 percent from 1949 to 1975, and by 25 percent from 1963 to 1975. As shown in Figure 6, there was a slight decline in the growing stock inventory of this group in 1963, Figure 7 shows the small but steady increase in sawtimber volume since 1949. The dip in growing stock in 1963 indicates that many pole-size trees were removed from the stands while the sawtimber-size trees continued to grow faster than they were removed from the inventory. From 1963 to 1975, other species in this group asserted themselves, and this, combined with a decline in demand for products derived from this species group, explains the current upswing in both the growing-stock and sawtimber inventories.

The distribution of this species group, because of its unusual composition, is unlike that of the other seven groups. The Western Coalfield and Pennyroyal Units are the leaders with a combined 44 percent of both the growing-stock and sawtimber volume. Four other units each have about 12 percent of both growing stock and sawtimber: Western, Bluegrass, Southern Cumberland, and Eastern. The Northern Cumberland Unit has only 8 percent of the growing-stock volume and 6 percent of the sawtimber volume.

Hickory. For volume, the hickories of Kentucky

are the next most important species group. This group contains 1.5 billion cubic feet of growing stock (13 percent), and 3.0 billion board feet of sawtimber (11 percent). The volume of hickory has risen steadily in Kentucky since the first survey, about 50 percent from 1949 to 1975 (Fig. 6).

While hickory is found in all parts of the State, the growing-stock and sawtimber volumes are distributed somewhat differently. For growing stock, most of the volume is found in the Western Coalfield Unit, but the Pennyroyal, Northern and Southern Cumberland, and Eastern Units are close behind. These five units account for 87 percent of this volume. For sawtimber volume, the Western Coalfield and Eastern Units are highest with a combined 43 percent. The Pennyroyal and Southern Cumberland Units account for 33 percent, and the Northern Cumberland, Western, and Bluegrass Units have a combined 24 percent.

Hickory sawlog production in 1974 amounted to only 8 percent of the total (Bones and Lohr 1977). Since hickory accounts for 11 percent of the sawtimber volume, this indicates that not enough hickory is being cut to maintain a stable inventory—so the inventory rises. The hickories are economically important not because they produce large quantities of wood, but because this wood has exceptional characteristics. Hickory is nearly unrivaled for elasticity and strength. Several manufacturing plants in Kentucky make wood handles, and hickory is a preferred species for handles of such striking tools as picks and hammers.

Yellow-poplar. After white oak and black oak, yellow-poplar is the single species with the most volume in Kentucky. This species alone accounts for 9 percent of the wood in the State. The growing-stock volume of yellow-poplar is 1.0 billion cubic feet, more than double the amount in 1949. Sawtimber volume stands at 2.4 billion board feet, an increase of 71 percent since 1949.

Yellow-poplar is an attractive timber species because it grows fast, has excellent form, and is unusually resistant to insects and disease. This species accounts for 13 percent of the sawlog production of Kentucky and 12 percent of the veneer production (Bones and Lohr 1977). Though the demand for yellow-poplar is relatively strong, both growing-stock and sawtimber volume have been rising since 1949. The main reason for this, as is true for nearly all species, is that annual net growth has consistently exceeded annual timber removals and annual mortality since 1949.

More than one-half—54-percent of the growing-stock volume of yellow-poplar is in the Eastern and Southern Cumberland Units. It is also commonly found in the Northern Cumberland and Pennyroyal Units, which account for 34 percent of its growing-stock volume. The Western Coalfield, Western, and Bluegrass Units contain only 12 percent. Sawtimber volume is distributed similarly throughout the State. The Appalachian Mountains in eastern Kentucky form the heart of the range of yellow-poplar.

Softwoods. Hard pines (shortleaf, Virginia, and pitch) make up 77 percent of the softwoods in Kentucky. Eastern redcedar accounts for 13 percent, and other softwoods such as eastern white pine and hemlock account for 10 percent. Softwoods account for 8 percent of the growing-stock volume, and 7 percent of the sawtimber volume. There are about 860 million cubic feet of growing stock and about 2 billion board feet of sawtimber. Softwood volume has increased by more than 80 percent since 1949, and by 40 percent since 1963.

Softwoods supplied 19 percent of the pulpwood production, 99 percent of the post production (primarily redcedar) and 100 percent of the pole production in 1974. Overall demand for softwood in Kentucky has increased slowly since 1962, but softwood growth has increased at a greater rate. Much of the abandoned farmland in the Bluegrass and Eastern Units has seeded into softwood species, and this addition to the commercial forestland area has contributed to the increases in softwood volume.

The softwoods are concentrated in eastern Kentucky. The Southern Cumberland Unit dominates the growing-stock and sawtimber volumes with 41 and 46 percent, respectively. The Northern Cumberland Unit has about one-quarter of the softwood volume. Seventy-six percent of the growing stock of hard pine is in these units. Most of the Daniel Boone National Forest is in these two units, so it is not surprising that 17 percent of the softwood growing stock and 21 percent of the softwood sawtimber is on the Forest. The Pennyroyal and Eastern Units account for 24 percent of the softwood growing stock and 21 percent of the softwood sawtimber. The remaining three units contain about 10 percent of the softwood volume of the State. Redcedar is prominent in the Pennyroyal and Bluegrass Units, where 77 percent of its growing stock is located. Redcedar frequently grows in the rocky limestone and dolomite areas

that are common in this central region of Kentucky.

Maple. Kentucky has only slightly more sugar maple than red maple. These species combined make up 7 percent of the growing stock in the State (850 million cubic feet), and 6 percent of the sawtimber (1.6 billion board feet). Maple volume rose by nearly 150 percent from 1949 to 1975. Again, this increase can be attributed to a slowed demand and a continued increase in growth. Although maple occurs throughout Kentucky, about one-half of the volume is found in the Western Coalfield and Pennyroyal Units. The Eastern Unit ranks third in maple volume with about 16 percent.

Beech. Beech accounts for only 4 percent of the growing-stock volume and 6 percent of the sawtimber volume. In 1975, the growing-stock volume was nearly one-half billion cubic feet, an increase of 25 percent since 1963. The sawtimber volume was 1.7 billion board feet—up 33 percent since 1963.

The slight increase in beech volume from 1963 to 1975 seems to be due to a drop in demand for beech timber. Sawlog production in 1969 was 35.6 million board feet (Bones and Lohr 1972); by 1974, production had dropped to 27.1 million (Bones and Lohr 1977). Most beech goes into lumber and eventually ends up in furniture. Beech also makes excellent fuelwood because of its high energy value, and railroad ties when treated with preservatives.

Volume by forest type groups

Since certain tree species commonly associate with one another, thus forming plant communities, it is desirable to consider volume by forest type group as we did earlier in our discussion of forest area. The growing-stock volume on the commercial forest land of Kentucky is divided into six major groups (the seventh, white and red pine, amounts to less than 1 percent) (Fig. 9). The distribution for sawtimber is similar. Not surprisingly, oak/hickory predominates due to the large volumes of oak, hickory, yellow-poplar, and other associated species. This group accounts for 7.9 billion cubic feet of a total of 11.4 billion. Maple/beech/birch is a distant second with 1.4 billion cubic feet, and includes volumes of maple (primarily sugar) beech, black cherry, and black walnut. Elm/ash/red maple and oak/gum are generally bottomland groups, and because their acreage

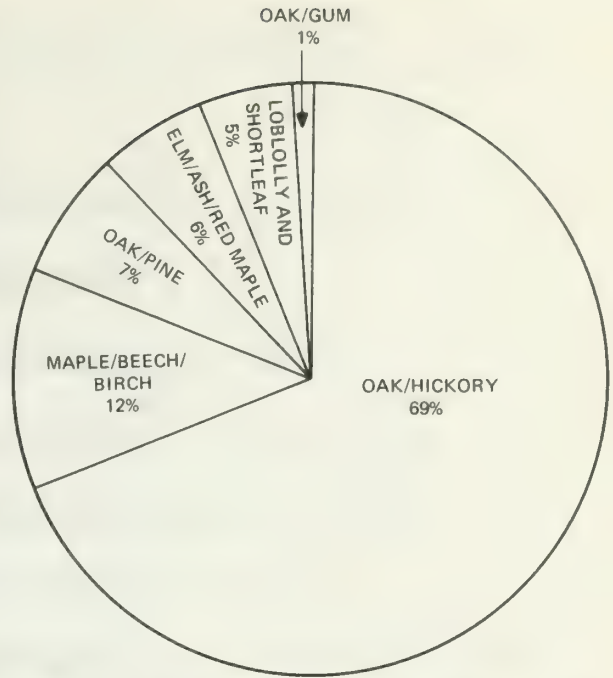


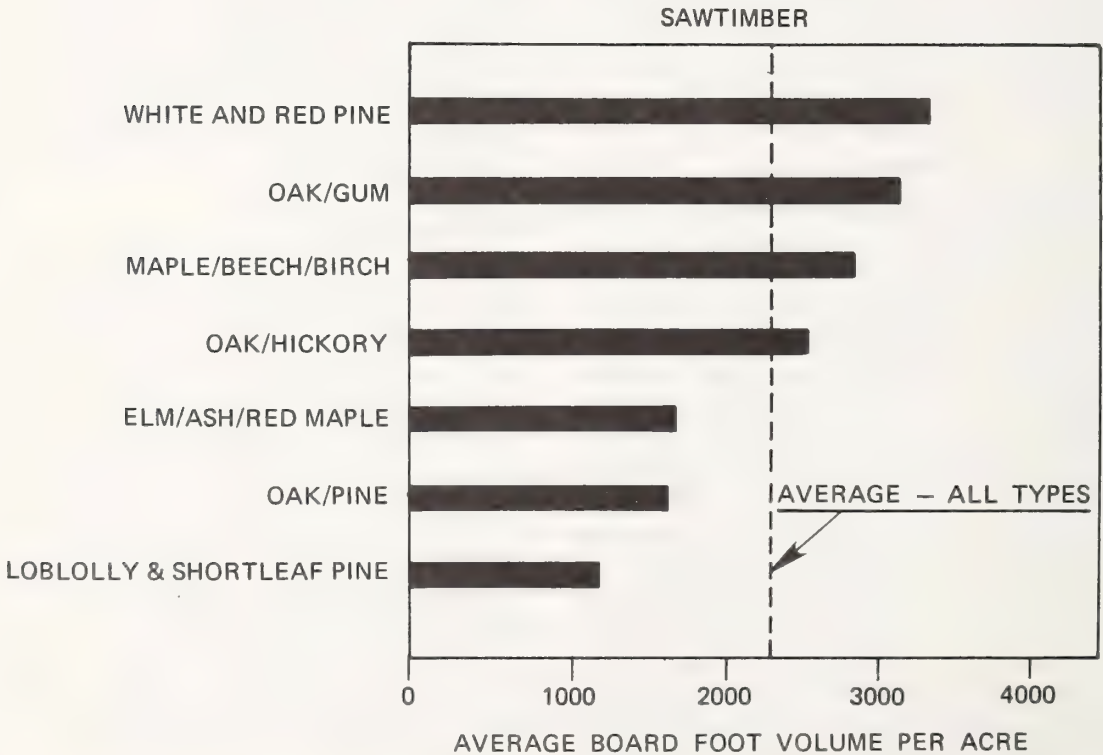
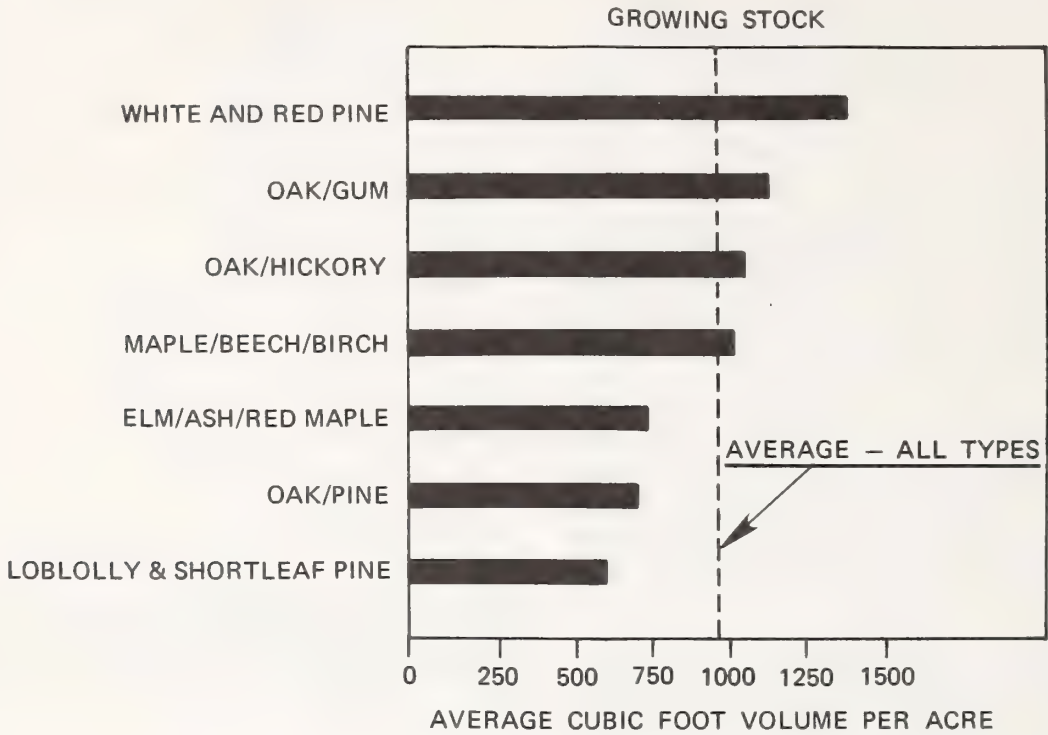
Figure 9.—Percent growing-stock volume, by major forest type group, Kentucky, 1975. (White and red pine type group amounts to less than 1 percent.)

is small they contain only 811 million cubic feet. Oak/pine, with 756 million cubic feet, is influenced largely by oak volume. The loblolly and shortleaf pine group, with 570 million cubic feet, contains nearly one-half of the growing-stock volume of softwood.

Volume per acre

The average volume per acre of commercial forest land also differs from one group to another. Figure 10 shows how the seven groups rank for both growing-stock and sawtimber inventories. The ranking is quite similar in both cases. This can be explained by the distribution of the groups by stand size. The white and red pine group is composed entirely of sawtimber hemlock stands, and thus it has the highest volume per acre. Since the loblolly and shortleaf pine group has 53 percent of its stands in the seedling-and-sapling size, its volume per acre is the lowest. The other five groups have different intermediate proportions of sawtimber, poletimber, and seedling-and-sapling stands, and their rankings can generally be accounted for on this basis.

Figure 10.—Average volume per acre for growing stock and saw-timber, by major forest type group, Kentucky, 1975.



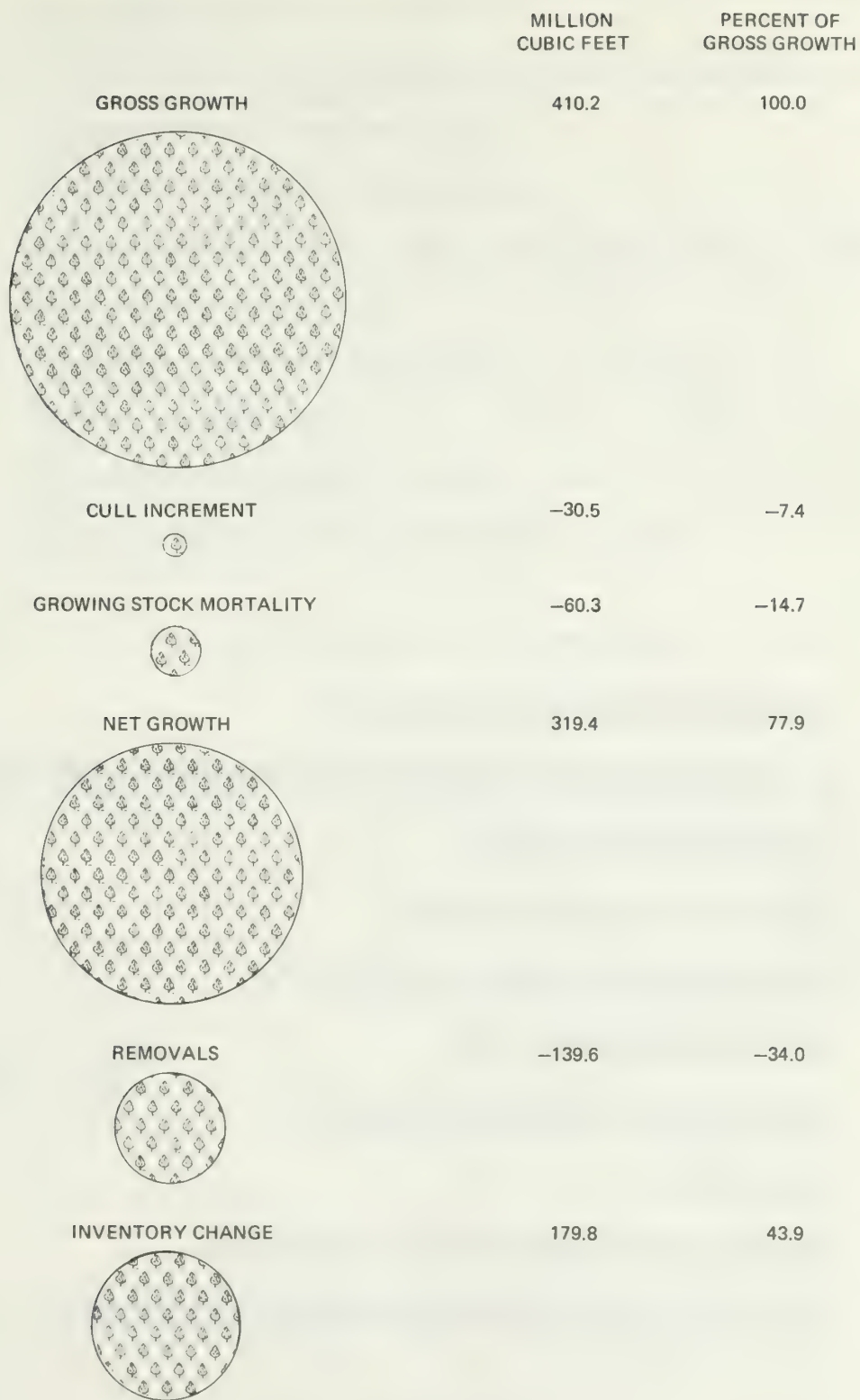


Figure 11.—Components of average annual change in growing-stock inventory, Kentucky, 1962-1974.

GROWTH AND REMOVALS

The substantial increases in inventory were due to various interrelated causes. By 1949, the period of heavy timber cutting had passed. Kentucky was growing more timber than was being harvested, and the forests were well on the road to recovery from the heavy cutting of the first 25 years of the century. However these new forests did not contain the high proportion of valued species—black walnut, butternut, black cherry, and basswood—that the original forests contained. These facts alone would have foretold an increase in the inventory; but from 1949 to the early 1960's, timber harvesting for products declined. In 1949, Kentucky harvested 154.7 million cubic feet of growing stock for products. By 1962, this portion of the harvest had dropped to 104.3 million cubic feet. From 1962 to 1974, the decline had moderated, this portion of the timber harvest stood at 94.3 million cubic feet in 1974.

How the inventory changes

The annual change in the inventory is equal to the net growth less timber removals. Timber removals include the volume of growing-stock removals from the inventory for products and logging residues, as well as volume lost in land clearing or from changes in land use. Net growth is equal to the total volume of growth (gross growth) less cull increment (the volume of sound merchantable material that becomes rough or rotten) and growing-stock mortality (the volume of growing-stock trees that die during the year). It is these components of inventory change that the forester seeks to manipulate when he manages a forest. Figure 11 shows the components of average annual change in the inventory of growing stock for the 1962-74 period. Note that more than 22 percent of the volume grown in an average year is lost to cull increment and growing-stock mortality.

In 1974, total timber removals amounted to

Figure 12.—Annual growth and removals of growing stock, Kentucky, 1974.

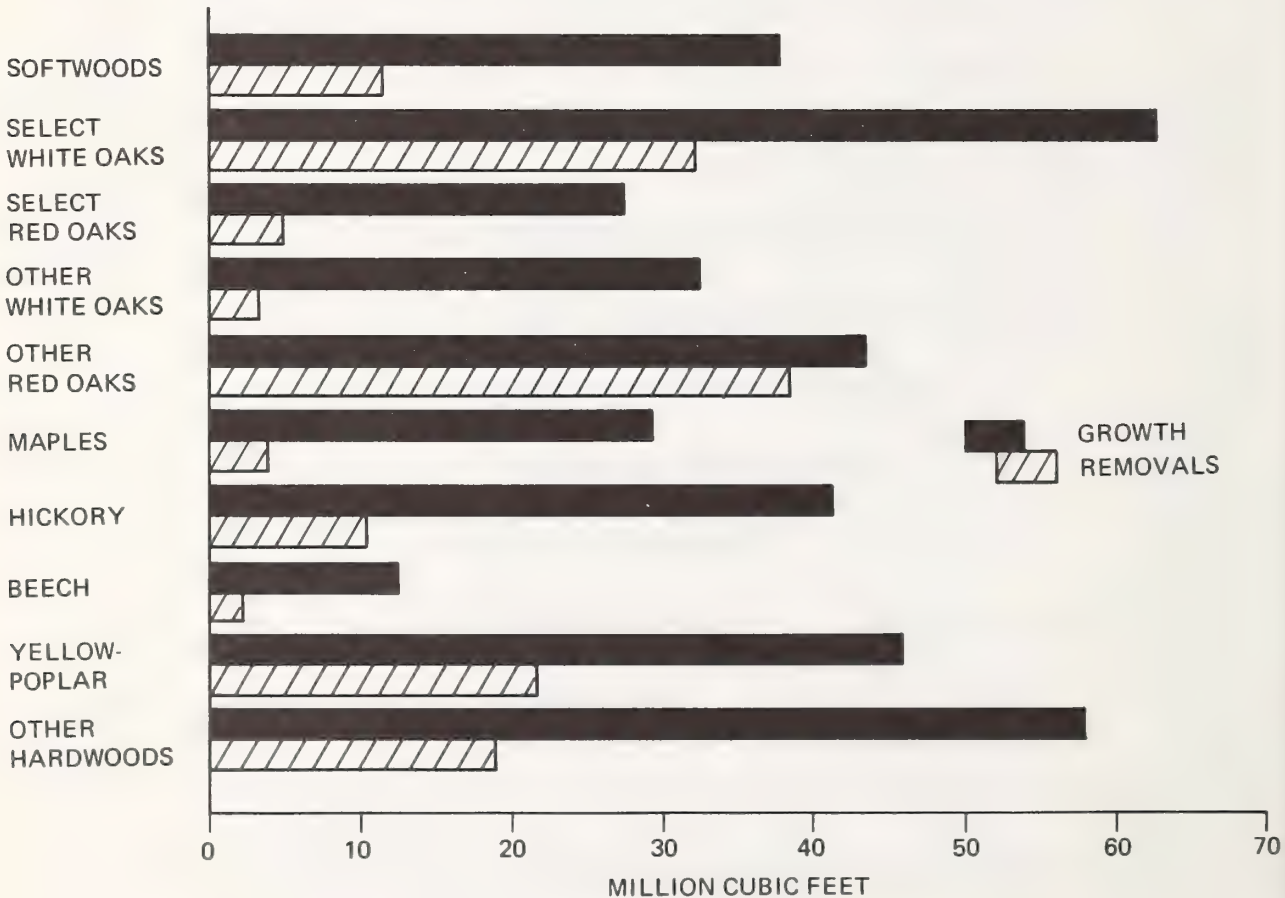
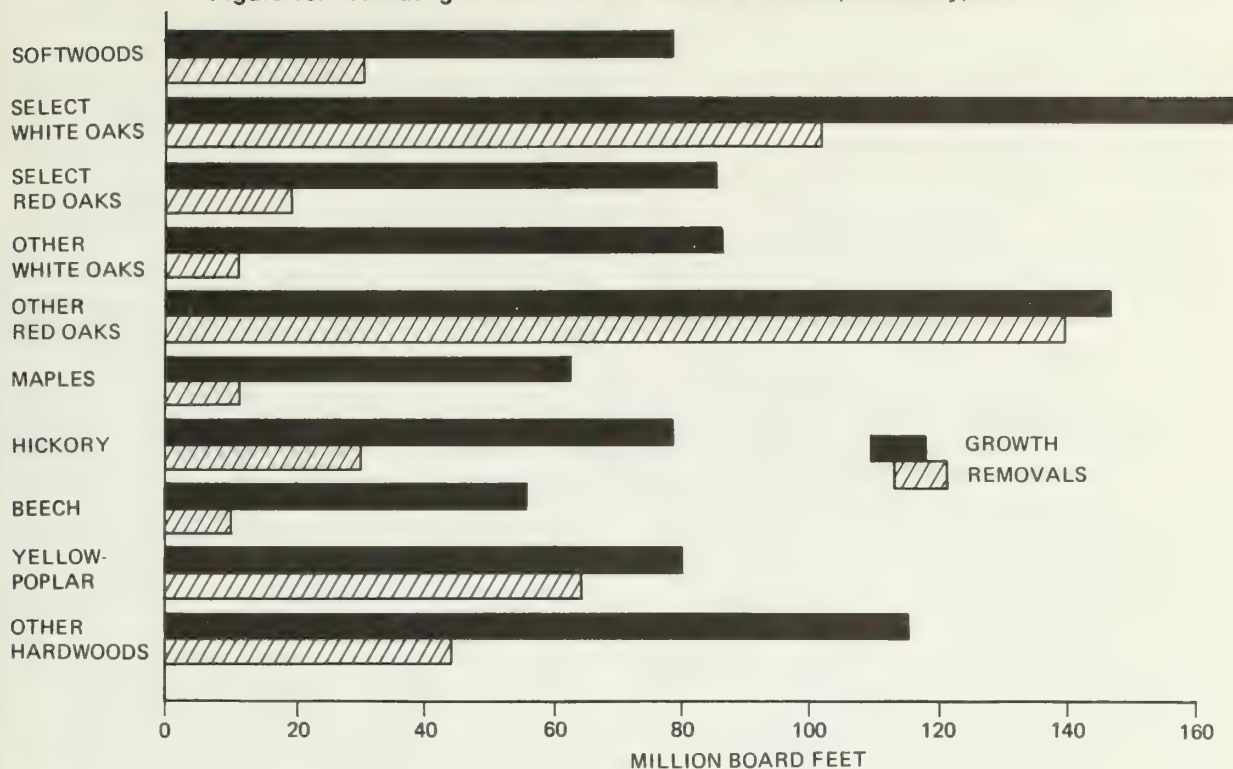


Figure 13.—Annual growth and removals of sawtimber, Kentucky, 1974.



149.6 million cubic feet of growing stock and 528.8 million board feet of sawtimber. On this volume, 94.3 million cubic feet were removed and used for forest products. An additional 25.9 million cubic feet of logging residues were produced. This is growing-stock material that was left in the woods during logging—often material in trees that were inadvertently destroyed during logging, or portions of trees for which no market exists. Trees are often removed from the inventory for reasons other than timber production, land clearing for highway rights-of-way, housing and urban construction, or changes in land use such as from commercial forest land to parks or golf courses. In 1974, 29.4 million cubic feet were removed for such reasons.

The 1974 data are based on the results of a mail canvass of the producers and consumers of Kentucky forest products. The data represent as nearly as possible the amount of timber removed during the year. This raises a question: Was more or less timber removed in 1974 than we would have anticipated, from the recent trend? To answer this we look at trend-level removals (Table 21). Trend level estimates of removals are developed by fitting a curve to the available data from

several points in time. Thus the comparison of the actual 1974 removals with the trend-level estimate shows that 1974 removals were essentially at the level we would anticipate on the basis of recent trends. The trend-level estimate for 1974 was 148.9 million cubic feet, while actual reported removals for the same year were 149.6 million. Users of these data should keep in mind that Tables 21, 22, and 23 are trend-level estimates, and that Tables 25 through 28 are based on data from a canvass of primary wood processors.

Species removals

No timber species in Kentucky is being overcut. The species group closest to being overcut is the other red oaks. In this group, 89 percent of the annual net growth of growing stock was removed, and more than 95 percent of the sawtimber growth was removed. Three species groups that have a generally low demand in Kentucky—maples, hickory, and beech—reflect low ratios of removals to growth. So these species are increasing the inventory at the expense of more valued species. Figures 12 and 13 show the relationship of growth and removals for both growing stock and sawtimber by the major species groups in Kentucky.

TIMBER-PRODUCTS OUTPUT

The estimates of timber-product output in Tables 25 through 28 should not be confused with the estimates of annual timber removals in Tables 20, 21, and 22. Timber-product output is that portion of the total timber harvested that was used for products. In addition to timber removed for products, timber removals include logging residues and other removals such as those due to land clearing and changes in land use.

Lumber and sawlogs

Sawmills were undoubtedly among the first manufacturing establishments in Kentucky. These were first pit or whipsaw mills and later water-powered mills. Most of their production was for local use. By 1830, however, the steam-powered sawmill was coming on the scene. This development helped increase lumber production greatly, and the production of lumber for sale on the open market became commonplace. About this time, white oak was in demand in France for wine casks. From this beginning, Kentucky soon developed its prominence in the hardwood lumber industry.

From 1869 through 1946, Kentucky consistently ranked among the top 10 hardwood lumber-producing states. And, during the 10-year period from 1905 through 1914, the State never dropped below fifth place. It was during this latter period that lumber production in Kentucky reached its peak. In 1907, the 1,451 sawmills then operating produced 913 million board feet of lumber (Fig. 14).

In 1974, sawlog production, the raw material for lumber, totaled 489 million board feet. This production is up slightly from the 460 million board feet produced in 1962. However it is only slightly more than half the peak production of 1907. Not only has production dropped to nearly half the peak production but the mixture of species harvested for sawlogs has also changed. Yellow-poplar, which accounted for 23 percent of the sawlog harvest in 1907, accounted for only 13 percent in 1974. Yellow-poplar is a versatile "soft" hardwood species that has always been in demand.

Twenty-three percent of the 1974 harvest of sawlogs was "other" hardwoods. These include all hardwood species found in Kentucky other than yellow-poplar, white and red oaks, and hick-

Sawlog production ranks first in Kentucky . . .



Kentucky Division of Forestry Photo.

. . . but pulpwood production is expanding rapidly.



Kentucky Division of Forestry Photo.

Figure 14.—Lumber production in Kentucky, 1870-1972.

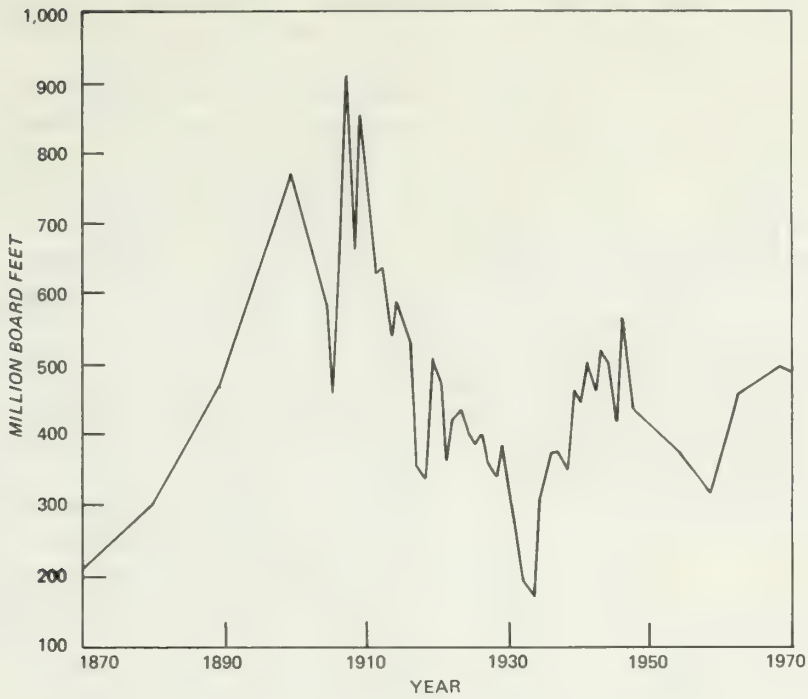
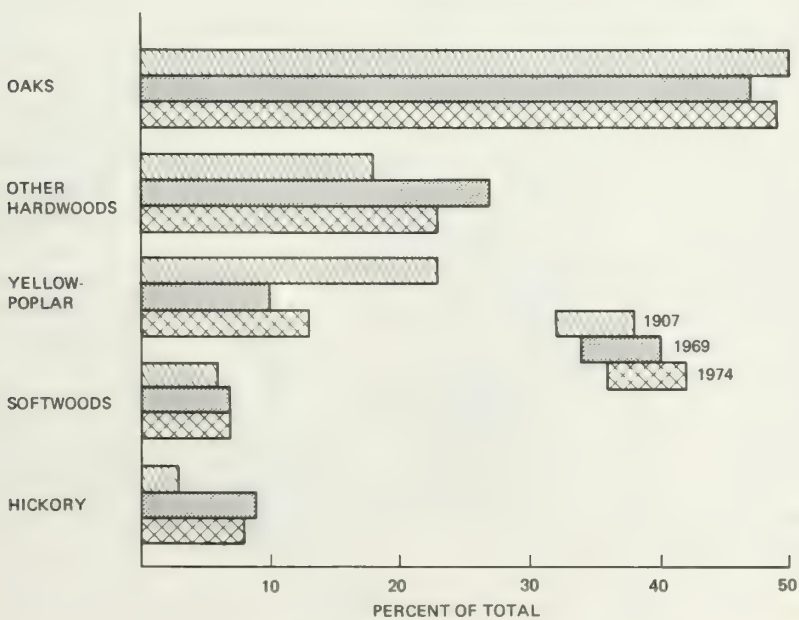


Figure 15.—Percent change in sawlog production, by major species, Kentucky, 1907-1974.



ories. In 1907, only 18 percent of the harvest was "other" hardwoods, 5 percent of which was American chestnut, a species that, because of the blight, no longer exists in sawlog sizes. Thus the harvest of the boom years was more demanding on particular species than is today's harvest. Figure 15 shows the changes in sawlog production by major species in Kentucky.

The number of sawmills in Kentucky has been declining. In 1907 there were 1,451 mills; by 1974, there were only 388 (Fig. 16). However the modern sawmill produces much more than those of the boom period. On the average, the modern sawmill produces twice as much as the 1907 mill—1,260,000 board feet per year versus 629,000. Nearly a fourth of today's mills are capable of producing more than 2 million board feet per year, and several are capable of producing more than 5 million.

Pulpwood

Before 1967, what pulpwood that was produced in Kentucky was shipped to pulpmills in neighboring states. Hardwood pulpwood moved north, pri-

marily to Ohio, and softwood went south to Tennessee. In 1967, the first woodpulp mill in Kentucky began operating in Hawesville. Although this mill depended primarily on wood residues from other wood-using industries, it marked the beginning of a phenomenal expansion of pulpwood production in the State (Fig. 17). In 1969, a second pulpmill was opened at Hawesville. This mill used mostly roundwood. A third mill at Wickliffe went into production in 1970.

Production rose almost without interruption from 35,000 cords in 1955 to 438,200 in 1973 and 396,400 in 1974, an off year. Before 1960, annual pulpwood production generally ranged from 20,000 to 52,000 cords. In 1973 more than half the pulpwood production of Kentucky was from wood industry residues. Of the portion that was roundwood, more than 83 percent was hardwood. Before the development of pulping capacity, the pulpwood output of Kentucky was almost evenly divided between softwoods and hardwoods.

Before the development of a woodpulp industry, the forest industries in the State were, with the exception of those that produced mine props and

Figure 16.—Custom and commercial sawmills in Kentucky.

ANNUAL CAPACITY

- ▲ OVER 5 MILLION BOARD FEET
- 1 TO 5 MILLION BOARD FEET
- UNDER 1 MILLION BOARD FEET

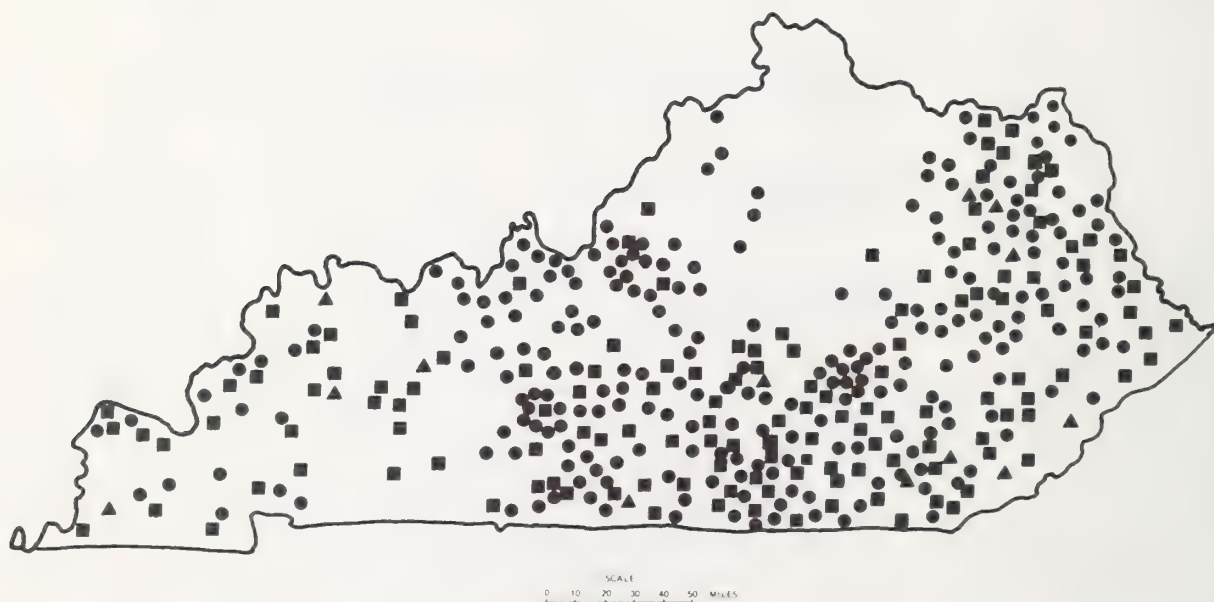
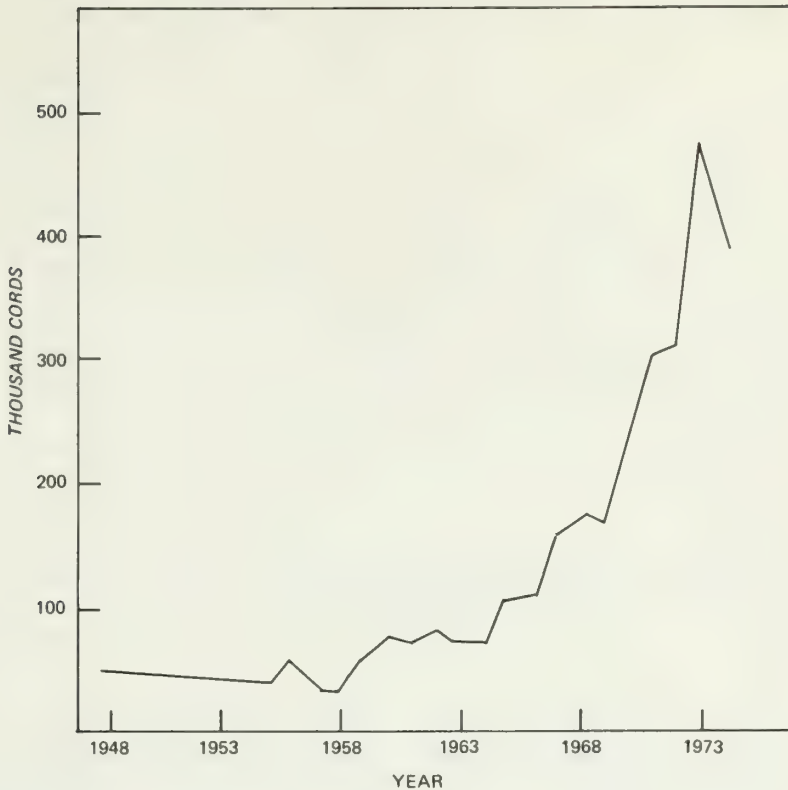


Figure 17.—Pulpwood production in Kentucky, 1948-1974.



charcoal, geared to quality material. The newly emerged pulpwood market provides an outlet for lower grade material, opportunities for integrated logging, and opportunities for profitable timberstand improvement. The demand for wood residues by the pulpwood market provides sawmills and other wood-using plants with a market for what was previously considered waste. This market often can mean the difference between profit and loss to the plant operator. From an environmental viewpoint, the use of residues for pulpwood reduced the number of unsightly slab piles and slab burners.

Veneer logs and bolts

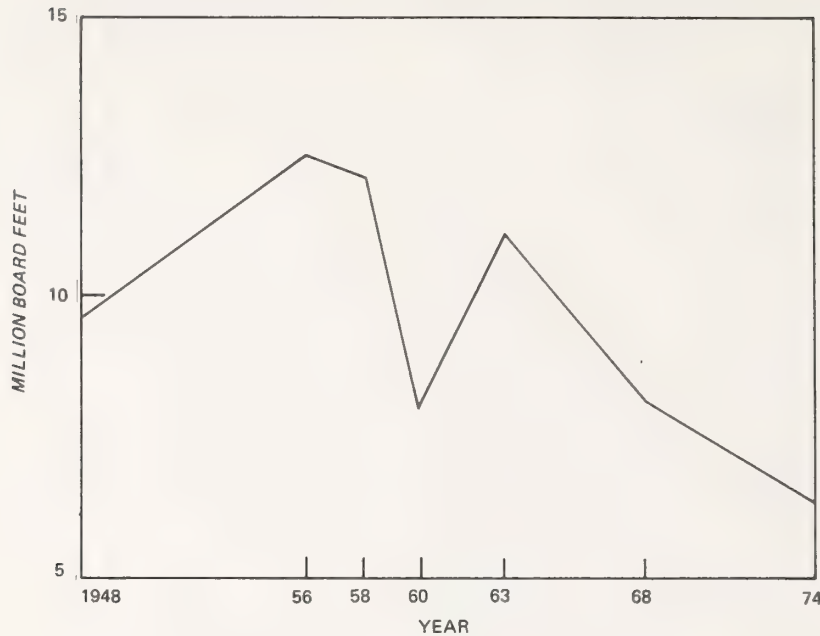
The veneer manufacturers in the northeast United States can be separated into three broad classes: (1) manufacturers of commercial and face veneer who produce veneer for the plywood and furniture industries; (2) manufacturers of container veneer who produce veneer boxes, baskets, and similar containers; and (3) specialty manufacturers of veneer who produce a variety of products ranging from toothpicks to tongue depressors. All of the

veneer manufacturers in Kentucky produce commercial and face veneer, and generally use species such as black walnut, black cherry, and oak.

In 1974, 6.3 million board feet of veneer logs and bolts were harvested in Kentucky. Of this volume, only 2.4 million board feet were retained in the State to be processed by the four operating veneer plants. Another 4.5 million feet of veneer logs were shipped to Kentucky for processing.

Veneer logs have the highest value per unit of all timber products. This, plus specialization in the veneer industry, means that logs are frequently shipped a considerable distance to consuming mills. This helps explain what happened to the 1974 veneer-log harvest of Kentucky. For instance, although 1.7 million board feet of black walnut veneer logs were harvested, Kentucky mills received 2.7 million board feet. Similarly, 1.9 million board feet of hickory, red oak, and white oak were harvested, yet Kentucky veneer mills received 3.4 million board feet of these species. On the other hand, all of the 1.3 million board feet of cottonwood veneer harvested in Kentucky were shipped out-of-state, probably to container veneer manu-

Figure 18.—Veneer-log production in Kentucky, 1948-1974.



facturers who typically use this species as well as yellow-poplar, soft maple, and sweetgum. In fact, Kentucky mills received only 26 percent of the sweetgum harvest and 16 percent of the yellow-poplar harvest. The rest went out-of-state. Some Kentucky-grown veneer logs even travel to Europe or Japan for processing.

The commercial veneer industry is subject to consumer preference. Production peaked in 1956 at 12.5 million board feet and began to decline until 1963 when there was a brief recovery. However veneer production has declined since 1963 (Fig. 18).

Cooperage-log production

The distilling industry in Kentucky gave rise to the cooperage industry. This industry uses exclusively quality white oak stave bolts. The aging process for most whiskies calls for them to be aged in white oak barrels, which give the spirits their distinctive flavor. Bourbon whisky must be aged in freshly charred barrels that have never been used.

The cooperage industry has been declining for many years. White oak of sufficient size and quality has become increasingly difficult to find. Consumer preferences in alcoholic beverages have shifted away from the whiskies to vodka and gin. In the early 1960's, production of tight cooperage

was cut back while the distilling industry awaited the outcome of a proposal to change the federal regulation forbidding the reuse of bourbon barrels for aging whisky. In 1970 the repeal became effective.

In 1974, 12.2 million board feet of cooperage bolts were produced, down from 21.4 million in 1964 (Fig. 19). The number of cooperage mills operating in Kentucky also dropped from 21 in 1964 to only 12 in 1974. The decline of the cooperage industry is even more precipitous when one considers that in 1948 there were 87 operating cooperage mills receiving 44.0 million board feet of logs and bolts.

The place of timber in the economy of Kentucky

The 98 million cubic feet of industrial roundwood harvested from Kentucky forest land in 1974 had an estimated total stumpage value of nearly \$17 million. After the trees had been cut and delivered to the consuming mills, this wood had an estimated value of nearly \$41 million. Thus the commercial forest-land area of Kentucky produced an average of \$1.42 worth of stumpage or \$3.44 worth of delivered timber products per acre.

According to the 1972 Census of Manufacture, wood-processing plants in Kentucky produced \$544 million worth of products in that year. This

Figure 19.—Cooperage-log production in Kentucky, 1948-1974.



does not include products from the furniture and fixtures industries. Although furniture plants use considerable volumes of wood, it is difficult to distinguish what portion of the total product value is attributable to the use of wood.

Wood-based industries do not constitute a large share of the total manufacturing—6.2 percent of manufacturing employment and 4.4 percent of the value of manufactured products in 1972. They are, however, significant in many rural counties. In Leslie, Knott, Menifee, and Webster Counties, wood-processing establishments account for more than 50 percent of manufacturing employment. In another 10 counties, they account for 25 to 50 percent of manufacturing employment.

Of the 3,169 manufacturing establishments listed by the 1972 Census of Manufacturers, only 596—less than 19 percent—were engaged in wood-based industries. Such industries tend to be relatively small; they employ only 6 percent of the manufacturing labor force. Average annual wages are also lower than in other manufacturing industries—\$6,894 compared to \$8,428 in 1972.

Wood-processing plants in Kentucky tend to be concentrated in the primary industries—those that do not produce a finished product. The development of secondary wood-products industries in

Kentucky would allow more of the value added in manufacturing to remain in the State. Value added is the difference between the cost of goods purchased by an enterprise and the value of the products it sells. It is the amount available for wages and salaries; interest; profits; and taxes—or the money that keeps both the enterprise and the community at large alive, well, and growing. With the present primary-secondary mix, substantial volumes are shipped out of state for manufacture into final products.

Hair (1963) reported that in 1958 each \$1 worth of stumpage cut increased in value 25 times by the time it reached the final consumer. Primary manufacturing added \$3.85 while secondary manufacturing added \$5.45. While these data are old, the ratios are probably still valid. Secondary manufacturing also contributes substantially to employment in timber-based industries. Secondary manufacturing alone accounts for 24 percent of the employment needed to move wood to the final consumer (Hair 1963). By contrast, the three stages preceding secondary manufacturing—forest management, harvesting, and primary manufacturing—accounted for only 28 percent. Secondary industries also tend to upgrade the labor force to higher skill levels. Because of the generally higher

TIMBER-SUPPLY OUTLOOK

capital and skill requirements needed for secondary industries, they usually provide more stable employment.

There are several reasons why a larger secondary wood-based industry has not developed in Kentucky. Most of the heavily forested regions of the State lack adequate plant sites. To be profitable, most plants require several acres of developable land adjacent to rail or highway networks. Topography is an important factor. It is interesting to observe that those wood-using industries that are considered secondary—flooring, furniture parts, wooden furniture, turnery products, veneer, and millwork—tend to cluster on the edges of heavily forested areas rather than within them (Bowman and Haynes 1963).

Another limiting factor is water. A constant supply of water is essential for the woodpulp and paper industries. Yet in most of the heavily forested regions, extreme fluctuations in water supply are common. Water quality is also important in the manufacture of bleached paper.

Most of the timbered regions of Kentucky are far removed from the major consuming areas. The final destination for most secondary wood products manufactured in Kentucky is the urban-industrial eastern seaboard or the shores of the Great Lakes. In most cases, the costs of moving finished goods to these areas would offset the comparative cost advantages of other factors of production, such as wood or labor.

It is frequently argued that the forested regions of Kentucky have a surplus of labor, however this surplus is primarily unskilled and semiskilled. The secondary industries require skilled labor. It may require several years to adequately train an employee.

Any secondary wood-based industry that could develop and thrive in the timbered regions of Kentucky must be one that can balance a comparative disadvantage in one area of its operations against a comparative advantage in another. As seen from the previous discussion, the opportunities for wood-using industries to achieve this balance in Kentucky are limited. However the establishment of competitive wood industries in rural Kentucky would add greatly to the economic well-being of the region.

Although national production of hardwood sawtimber has been projected to increase from 11.2 billion board feet in 1970 to 18.9 billion in 2000 (Forest Service 1973), it is doubtful that Kentucky will contribute much to this increase. This is because of the poor competitive position of the State compared to other major hardwood regions, rather than any inability of the land in the State to grow trees.

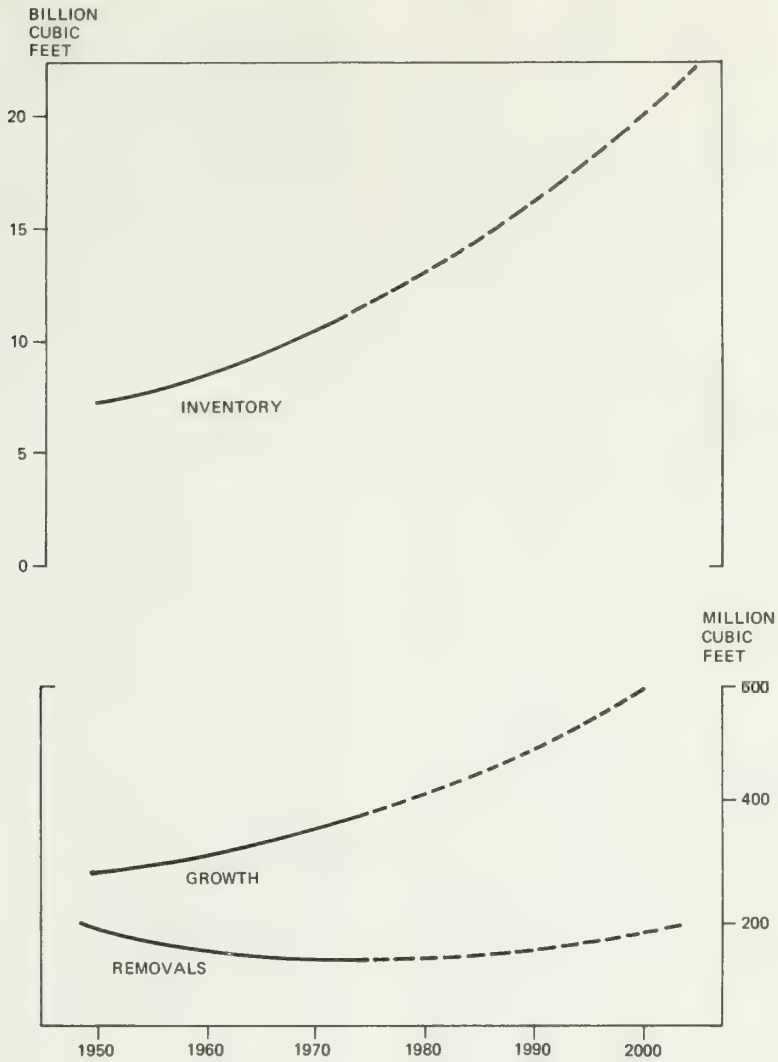
More than one-half of the volume of growing-stock and sawtimber is concentrated in eastern Kentucky, where the timber grows on steep slopes and in narrow valleys. Such sites offer poor opportunities for efficient harvesting with modern equipment. Getting wood to the mill is also difficult because there is seldom a direct route. The forest land of Kentucky is primarily in private ownership, most of it in small tracts. Many of these may be too small to be logged efficiently. For all of these reasons it seems that geography alone has put Kentucky at an economic disadvantage.

What then do we see for the future timber supply of Kentucky? During the 25 years since the first forest inventory, total timber removals declined from 170 million cubic feet in 1948 to 148.9 million in 1974. All of the traditional timber industries of Kentucky declined, the only bright spot being the development of a pulpwood industry. As a result, timber removals declined and the volume of growing stock rose from 7.7 billion cubic feet in 1949 to 11.4 billion in 1974.

Looking into the future we see little evidence of a major reversal of these trends. Forest-land area should not increase significantly. Statewide, the area removed from forest by land use changes is expected to be offset by other areas that are allowed to revert to forest. Although we anticipate a 21-percent increase in timber removals, this added demand will be more than offset by the increasing annual net growth—and the gap between growth and removals will continue to widen. Growth is expected to increase from 391 million cubic feet in 1974 to 661 million in 2004—a 69-percent gain.

The growing-stock inventory is expected to nearly double by 2004—from 11.4 billion cubic feet to 22.5 billion. Growth per acre will increase from 33 cubic feet to 54 cubic feet. Growing-stock volume, which in 1974 was 941 cubic feet per acre, will exceed 1,800 cubic feet per acre in 2004 (Fig. 20).

Figure 20.—Projected trends of inventory, growth, and removals of growing stock, Kentucky, 1949-2004.



TIMBER MANAGEMENT OPPORTUNITIES

Kentucky presents the forester with an assortment of timber-management opportunities or, more correctly, challenges. Seventy-five percent of the commercial forest land—nearly 9 million acres—is capable of producing 50 cubic feet or more per acre per year. One-third of the area is capable of producing 85 or more cubic feet per acre per year. Yet, on average, forest stands in Kentucky produce only 33 cubic feet per acre per year. Perhaps the most important single reason why growth is below potential is that most timber stands in the State are not optimally stocked. Nearly 2.8 million acres are overstocked with trees. However if we remove the rough and rotten trees, the area of overstocked stands drops to only 426,000 acres. This means that on 2.4 million acres, cull trees are competing with growing-stock trees, thus the growth on merchantable trees is reduced. These 426,000 acres contain too many growing-stock trees for optimum growth. Thus an important opportunity exists to reduce many timber stands to an improved level of stocking.

The pessimist will say this is easier said than done, and he's right. It would be a monumental task to treat all of the stands in the State. So it is important to identify, on the ground, those stands that present the best opportunity for success. Some stands are in such poor condition that the most realistic treatment would be to liquidate the present stand and regenerate a new one. This is especially true for the many acres of understocked commercial forest land. In other instances, the stands may be so close to maturity that they will derive little benefit from release. These stands should be carried through to maturity or harvested now and regenerated.

Another obstacle to forest management in Kentucky is the ownership pattern. The average forest-land owner in Kentucky owns about 24 acres—slightly more than half the average in neighboring West Virginia. As a rule of thumb, most foresters would agree that long-term management is difficult for tracts of fewer than 50 acres because they are too small to provide profitable returns at reasonable intervals. Yet, in Kentucky 35 percent of the privately owned commercial forest land is made up of tracts that are fewer than 50 acres.

Another obstacle to forest management in Kentucky is the high turnover of ownership. Twenty-

four percent of the commercial forest land owned by individuals has been held by the same owner for fewer than 10 years. Because a minimum of 80 years is required to produce quality hardwood sawtimber, few owners see their tracts through even a significant portion of such a rotation. In addition, only 9 percent of the privately owned commercial forest land in the State is held specifically for timber production. Thirty-one percent is held simply because it is part of the farm or residence.

All of these factors—tract size, turnover rate, and owner objectives or lack thereof—add up to perhaps the largest single obstacle to forest management in Kentucky. Means should be found not only to interest forest-land owners in the continued practice of forest management but also to work with groups of separately owned tracts of forest land over extended periods. Several techniques have been attempted to overcome these obstacles, such as landowner cooperatives and government or industry programs. However most of these programs have achieved only limited success. Perhaps one reason for this is that participation tended to limit the owner's options. Many forest-management activities take on the character of capital improvements. An owner who sells his land before the end of the rotation is not likely to be compensated for his investment.

Fire causes persistent forest-management difficulties in Kentucky. Many rural residents mistakenly believe that burning rids forest land of ticks, snakes, and briars, and improves livestock forage. In fact, few ticks and snakes would be eliminated by burning. While this year's briars may be killed back, next year's will be even thicker because the remaining rootstocks will sprout with renewed vigor. Burning does not improve livestock forage. In fact, fire kills the best grasses and forage plants. What comes in after fire is an abundant crop of plants low in nutrients.

Although fires in hardwood forests are seldom as spectacular as those in coniferous stands, the destructive effect is equally great, and may be longer lasting. Most trees less than 4-inches in dbh, and brush, will be killed outright. This sapling mortality, on the average, represents about 20 years of growth. When fires spread up slopes, nearly every tree will be killed, regardless of size. Large trees that aren't killed in a fire may be sufficiently scarred to provide an entryway for decay. It has been estimated that the average fire-wound-

ed, merchantable tree loses 15 percent of its volume to decay. But, more significantly, the value of such trees is reduced by 75 percent. This loss to decay and the consequent loss in value are two of the long-term effects of fire in the woods.

Another long-term effect results from the destruction of the layer of litter on the forest floor. The destruction of this layer of partly decomposed leaves, twigs, and other organic material exposes the fragile humus layer to leaching or erosion or both. Eventually, all that may remain is bare mineral soil that is low in nutrients and subject to temperature extremes. It may be many years before an adequate layer of litter is reestablished.

Since the beginning of organized fire control, Kentucky has compiled an impressive record. During the peak logging years of the early 1900's, fire frequently followed the destructive logging practices of the day, and thousands upon thousands of once prime timberland went up in smoke. These destructive fires only added to the time needed for full recovery. From 1949 to 1975, more than 6 million acres of forest land were burned by 91,735 fires. Some areas have been burned several times during this period, so some acres have been counted more than once. But from 1963 to 1975, 1.2 million acres burned; this amount is only 20 percent of the total. So fire control has definitely improved since the second survey of the woodlands of Kentucky. Nearly all of these fires were started by man; debris burning, smoking, and incendiaryism were the primary causes. It seems that this problem can be solved only by heightening people's awareness of how potentially destructive their actions can be.

THE FOREST-RELATED RESOURCES OF KENTUCKY

While this resurvey of Kentucky is primarily concerned with timber resources, other important resources are associated with the woodlands of the State. From an ecological perspective, the forest is composed of trees, shrubs, herbaceous plants, animals, microorganisms, soil, rocks, water, air, and solar radiation, all interacting in a vast and complex energy cycle. Though trees are the largest and most dominant part of this system, there is much more to a forest than wood. Resources such as water, soil, coal, fish, and wildlife, as well as recreation potential are inextricably related to each other and to the timber resource. Though

they will be discussed one at a time here for the sake of simplicity, isolating any one resource is neither practical nor advisable if a realistic picture of the forests is desired.

Water

The water resources of Kentucky have changed considerably since Daniel Boone first encountered the abundant free-running and pure streams of the forested wilderness. Nature's balance was first threatened in the late 1800's after man had converted many acres of forest and grassland to plowed fields, and had thoughtlessly logged huge tracts of virgin timber. Then, as the population of Kentucky rose, farming intensified, mining developed, industries began, and cities grew, forest land disappeared at an increasing rate. Consequently, this century began with streams flooding with increasing severity, streambeds filling quickly with silt, streamflows dwindling to dangerously low levels during dry spells, and streams becoming more and more polluted by man's waste products (Kentucky Department of Natural Resources 1971).

What does the disappearance of forest land have to do with these problems? What effects do trees and forests have on water in Kentucky? To answer these questions, we must look at the functions that trees have in the hydrologic cycle.

The major source of water in Kentucky is precipitation in the form of rain—40 to 50 inches per year. Most of the rain that falls on forests is readily absorbed by the litter and humus soil layers that act like a sponge. The capacity of forest soils for infiltration is so high that overland flow or runoff is rare (Lull 1971). Once this water enters the soil, tree roots take in much of it. In a year, forests may transpire one-half of the annual precipitation. To demonstrate the tremendous pumping capacity of trees, it has been shown that a single, moderate-sized willow or cottonwood, growing along the banks of a permanent water course or reservoir, is capable of transpiring over 10,000 gallons per year (Spurr 1964).

Though trees remove this much water from the ground, floods still occur in forested areas. One reason is that the State lies in the path of many storms. These storms occur in winter and in early spring when infiltration, transpiration, and evaporation are at a minimum (Kentucky Department of Natural Resources 1971). Another explanation is that the forests in Kentucky are often found on

Figure 21.—Major streams, rivers, and lakes of Kentucky, 1975.



steep slopes with thin soils. This combination leads to the ground water—water that has percolated through the soil to the water table—moving rapidly enough streamward to produce damaging peak flows (Lull 1971). This is especially true in eastern Kentucky.

When forests are cut but quickly regenerated, this situation is not worsened. But when the forests are removed and the land put to other use, such as agriculture or an urban development, floods occur with greater frequency and severity (Lull 1971). Forests are not the complete answer to flood control, but they help greatly.

Because forests currently make up only 48 percent of the land base of the State, and because afforestation on a large scale is not possible, something else had to be done. To protect man against floods and to meet the growing demand for water, many dams of all sizes were constructed in Kentucky. The reservoirs behind these dams store peak flows and later release water during low flow periods. These manmade bodies of water range in size from small farm ponds to Lake Cumberland, which has the largest volume of water of any lake in the United States east of the Mississippi River and south of the Great Lakes (Kentucky Department of Natural Resources 1971). Figure 21 shows the major streams, rivers, and lakes of Kentucky.

The U.S. Army Corps of Engineers has figured prominently in this construction, having built 14 multipurpose reservoirs, 9 of them since the 1963 forest survey. These dams serve the interests of flood control; municipal, industrial, and agricultural water supply; pollution abatement; navigation; recreation; low flow augmentation; and fish and wildlife. The Corps estimates that flood-control projects have prevented damages totaling nearly \$500 million in Kentucky since their completion (U.S. Army Corps of Engineers 1977).

The U.S. Bureau of Census estimated that the water area of Kentucky increased from 532 to 745 square miles from 1960 to 1970. This increase of 40 percent in water area occurred primarily in the Pennyroyal, Western Coalfield, and Western Units, where thousands of acres of artificial lakes have recently been created.

Besides flooding, Kentucky has other water resource problems. An important one is sedimentation. Sediment is fine particles of clay and silt eroded from fields, forests, mine dumps, urban areas, and other areas that eventually end up in streams. Sediment harms the resource by increasing costs for water treatment, decreasing reservoir storing capacities, filling navigable stream channels, and adversely affecting aquatic life (Kentucky Department of Natural Resources 1971). To

Corps of Engineers' Photo.



Reservoir construction affects many forest resources.

control sedimentation, erosion must be minimized.

Forest land use is the best practice for erosion control. Soil fully protected by a cover of litter and humus beneath a forest stand contributes no sediment to streams (Lull 1971). When logging occurs, the potential for erosion rises. Cutting trees causes little or no erosion; erosion occurs when the soil is disturbed by roads and landings constructed to remove the timber. However, with care, a logging operation need not create significant erosion. A study in West Virginia showed the maximum stream turbidity from a cutover watershed with no road plan and no provision for drainage was 56,000 parts per million (ppm); with no road plan but roads drained, 5,200 ppm; with moderate planning and drainage, 210 ppm; and with careful planning and drainage, 25 ppm. For an uncut watershed, the maximum was 15 ppm (Lull 1971).

Also, coal mining often exposes certain minerals that produce acid when they come in contact with water. Acid water is harmful to aquatic life, increases costs for water treatment, decreases soil fertility, kills vegetation, and damages the forest resource for recreation, especially fishing and swimming.

The current reclamation law requires a pH between 6.0 and 9.0 for water leaving a mined area. This is fine for recent operations and present and future operation, but acid drainage remains a problem at older mines where operators did not treat effluent water.

Soil

Soil provides trees with four essentials; anchorage, water, mineral nutrients, and aeration for roots. How well nutrients, water, and air move through the soil to provide a proper rooting medium depends on the physical and chemical properties of the soil. The closer these properties are to

meeting the optimum requirements of the trees growing in a soil, the greater will be the soil's potential productivity for those trees. Also important in determining productivity are surface drainage, slope, stoniness, and erosion potential (University of Kentucky 1970).

While soils provide certain essentials for tree establishment and growth, trees provide soils with certain benefits that increase soil productivity. Tree roots growing through soil increase porosity and aeration of the soil and may even split rocks, furthering soil development. Trees also produce considerable organic matter, forming a layer of litter that eventually becomes humus and is incorporated into the fertile topsoil.

The optimum requirements for the growth of trees and agricultural crops often differ. Agricultural crops grow very poorly on steep slopes where soils are rocky, thin, and acidic, while trees may grow quite well on such soils. This is demonstrated by stands of shortleaf pine growing on the escarpment in eastern Kentucky. Some forest land cleared for farming subsequently turned out to be only marginally productive and had to be abandoned when times were hard. This land has reverted to its forested state, and this is the primary reason why the area of commercial forest lands has increased since 1949.

Though most soils will support tree cover, some are more suited for this than others. The Soil Conservation Service has developed woodland suitability classes for all major soil groups in Kentucky. These classes indicate the potential productivity of each soil group to produce tree crops. The following table gives the site index and average annual growth potential for certain species for classes 1, 2, and 3. By taking a weighted average of the class values for each soil type based on acreage per type, it is possible to determine an average woodland suitability class for each soil association (Fig. 22).

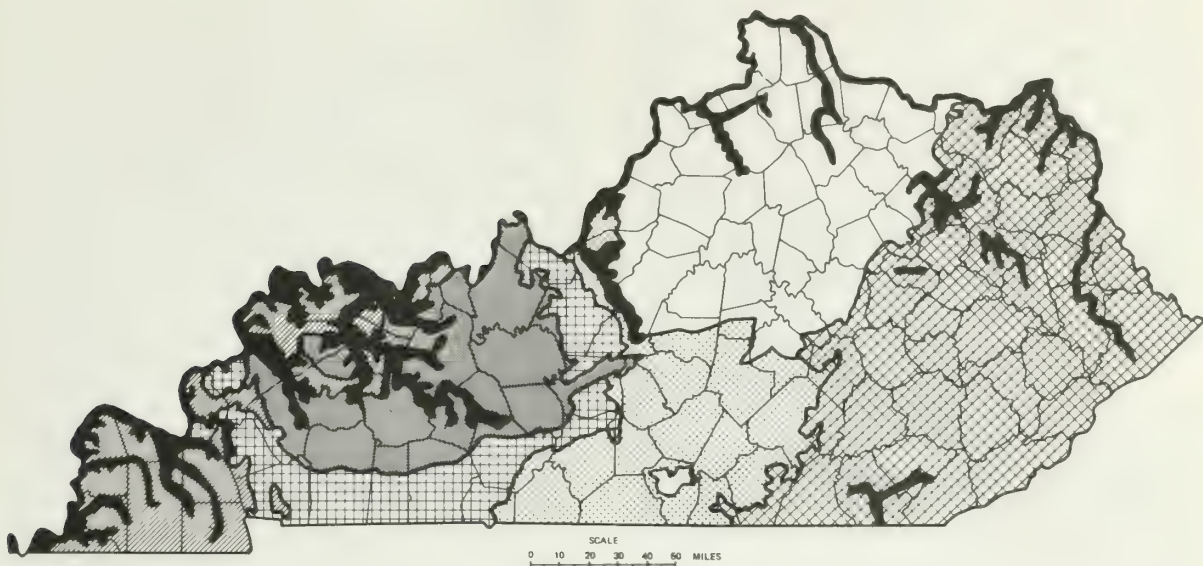
Potential productivity for woodland suitability classes of selected species for Kentucky








Species	Class 1 Very high potential productivity		Class 2 High potential productivity		Class 3 Medium potential productivity	
	Site index (height at age 50)	Average annual growth (bd. ft. per acre) ^a	Site index (height at age 50)	Average annual growth (bd. ft. per acre)	Site index (height at age 50)	Average annual growth (bd. ft. per acre)
Upland oaks	85+	350+	75-85	240-350	65-75	160-240
Lowlands oaks	95+	450+	85-95	350-450	75-85	240-350
Sweetgum	95+	500+	85-95	380-500	75-85	280-380
Yellow-poplar	95+	500+	85-95	380-500	75-85	280-380
Virginia pine	85+	650+	75-85	540-650	65-75	450-540
Shortleaf pine	85+	820+	75-85	670-820	65-75	540-670
Loblolly pine	95+	920+	85-95	740-920	75-85	570-740

^a International 1/4-inch rule.

Source: Technical Guide data, Soil Conservation Service, 1972.

Figure 22.—Soil associations of Kentucky, 1975. (Adapted from a Soil Conservation Service map.)



Symbol	Description	Average woodland suitability class
A 	Deep, well-drained to poorly drained soils on nearly level flood plains and undulating terraces of the major streams	1.5
B 	Deep, well-drained soils, formed in residuum from limestone with most areas having a thin loess mantle on undulating to rolling upland plains	1.6
C 	Deep and moderately deep, well-drained soils formed in residuum or hillside creep material from acid sandstone, siltstone and shale on mountain sides	2.0
D 	Deep, well-drained to poorly drained soils, formed in loess on undulating and hilly uplands	2.4
E 	Deep and moderately deep, well-drained soils, formed in residuum from acid shales, siltstone and sandstone with most areas having a thin loess mantle on hilly uplands and undulating broad ridgetops	2.5
F 	Deep and moderately deep, well-drained soils formed in residuum of cherty or shaly limestone on hilly uplands	2.8
G 	Deep, well-drained soils on undulating broad ridgetops and moderately deep or shallow, well-drained soils on hilly uplands, formed in residuum from limestone or interbedded shale and limestone	2.9

Though soils with a wide range of woodland suitability classes are present in each major group, the group averages show general regions in the State that are more suited to timber production than others. For example, the areas with soil group A are best suited for woodland because their average woodland suitability class is 1.5, or halfway between class 1 and class 2 in Table 1. Figure 22 shows these areas to be closely associated with the major river drainages. It is interesting that soil group G, with an average class of 2.9, is found in the Bluegrass Unit, the most agricultural region of the State. Thus the best agricultural land is actually the land least suited for timber production.

Of the several problems in soil resource management, erosion is the greatest. Soils that are too fragile should not receive destructive use. In fact, the Daniel Boone National Forest has prohibited the use of off-road vehicles in certain areas to protect the soil resource. Mass movement, such as slides or slumps, is a form of erosion that is a big problem on fragile soils on steep slopes. Care must be taken to avoid such areas in the construction of logging and mining roads.

Compaction of soils by machinery or by heavy recreational use damages the resource by reducing aeration and adversely affecting plant-soil-water relations. Compaction reduces the growth of trees, and when severe can lead to stagnation and

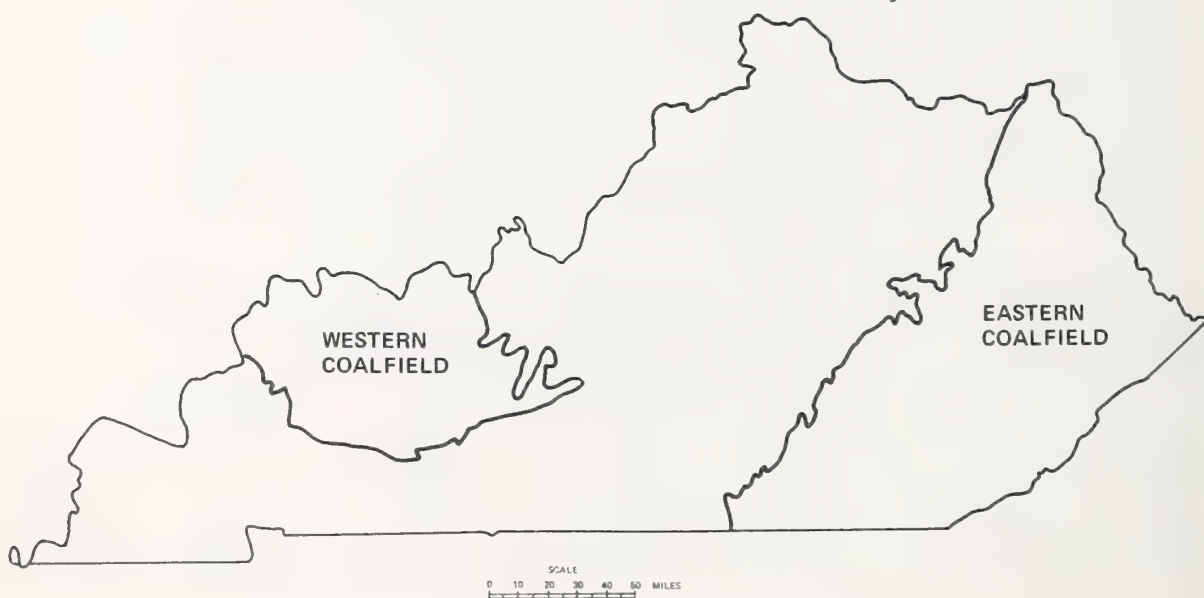
death. Soils prone to compaction such as clay soils should be avoided or protected with a hardened surface.

Coal

Coal is an ancient forest resource, formed by prehistoric forests some 275 million years ago. As the trees and ferns died, they fell into swamps, forming a tangled mass of decayed matter called peat. Peat is the raw material from which coal is formed; 1 foot of coal requires 5 to 8 feet of peat. After this peat was laid down, the areas sank and became covered with water, sand, and mud. The great pressure from the water above compressed the peat; this pressure forced out oxygen and hydrogen, leaving the carbon that eventually became coal. In some areas, the mantle of the earth buckled and folded, thus increasing the heat and pressure that formed the higher grades of coal (Kentucky Department of Natural Resources 1965).

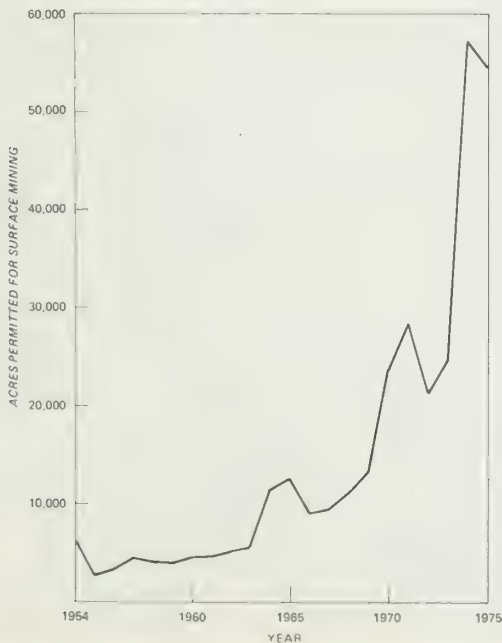
Kentucky is the only state with coalfields in two separate and distinct coal regions (Fig. 23). The eastern field, covering about 7.1 million acres, is in the Appalachian Region while the western field, covering 2.8 million acres, is in the Eastern Interior Region. The eastern field is 79 percent forested and includes 47 percent of the commercial forest land in the State. The western field is 44 percent forested, accounting for 10 percent of the commercial forest land.

Figure 23.—Distribution of coal fields in Kentucky.



While underground and auger mining often have a detrimental impact on forest land at the mine openings, storage points, waste dumps, and along haul roads, surface mining has a much greater impact on the State as a whole. Because of this, our discussion here will center on surface mining. Since the Kentucky Division of Reclamation began operations in 1954, permits to surface mine more than 322,000 acres have been issued. The number of permitted acres has increased dramatically in recent years (Fig. 24). These figures, when averaged over a number of years, are close to the number of acres that were actually mined. If you take the total figure, add 10 percent for haul roads, and take 69 percent of this figure (this is the percentage of commercial forest land for both coal fields combined) you have an estimate of about 245,000 acres of commercial forest land that have been disturbed by surface mining. Since the last survey, an average of 16,550 acres of forest land has been cleared each year. While this acreage is small compared to the forest resources of the State as a whole, the impact is substantial

Figure 24.—Acres permitted for surface mining in Kentucky, 1954-1975.



and the trend is toward more and more land clearing. If all of the coal recoverable by surface mining were stripped, more than 1.3 million acres of the commercial forest land of Kentucky could be disturbed.

In the eastern field there are more than 588,000 acres of commercial forest land in National Forest ownership. The present policy of the Division of Reclamation is not to issue permits for surface mining on any land where the surface rights are owned by the Federal government. This effectively prohibits strip mining on National Forest land. This policy is being contested in court because there is considerable coal tonnage underlying National Forest land. So for the present, the surface forest resources of the National Forests in Kentucky are not affected by the underground coal resource.

It is difficult to state how much of the wood removed from an area to be mined is ever taken to a mill and converted into a product. Though the eastern field is more heavily forested, probably few trees on a mine site are cut and removed to mills due to the rugged terrain, inadequate transportation networks, and distance to production sites and markets. Most of the wood is buried when the overburden is removed. In the western coal field, more of the wood is used because the topography is gentler, transportation networks and access are better, and mills, especially pulp-mills, are closer. When an operator decides to mine coal, his decision is rarely dependent on the maturity or condition of the forest cover of the land in question, so many immature stands are affected.

Reclamation of strip mines has obvious consequences for the forest resources. Kentucky passed its first law regulating strip mining in 1954 and has amended this law many times, the last time in 1975. Regulatory controls need to be under constant review, and improved as technology permits. Before the passage of reclamation laws, more than 40,000 acres of forest land in southeastern Kentucky were mined and abandoned without being reclaimed. The Tennessee Valley Authority and the Kentucky Department for Natural Resources and Environmental Protection, with Federal funding, are working on a reclamation demonstration to correct problems of surface water flow, erosion, and acid drainage. The goals are to return the "orphan banks" to productive forest and wildlife use, and to enhance esthetic values. Until

these mines are reclaimed, they will serve only as ugly reminders of what can happen to the coal-associated forest resources in the absence of good reclamation laws that are strictly enforced.

The regulations are meant to correct the undesirable situations associated with strip mining. Besides the excessive and unstable slopes that result in erosion, slides, and outwashes, strip mining leaves unnatural and unethic contours in the landscape, as well as the obvious highwalls that sometimes make upper slopes inaccessible. To alleviate these conditions, the law requires that area strip mines—generally in the western field—should be graded to the approximate original contour, that no depressions should be left to collect water, and that all highwalls and spoil peaks should be eliminated. On operations producing a bench—generally in the eastern field—highwalls must be reduced or backfilled except when they are solid rock.

While grading lessens erosion and esthetic concerns, revegetation helps even more. Before plant cover can be established, problems with acid spoils and drainage must be overcome. All acid-producing or toxic materials that are disturbed must be buried under 4 feet of clear overburden. In areas approved for grass or legume revegetation—generally in the western field—the spoil pH must be raised to a range of 5.5 or 6.4 by applying limestone. If spoil pH is not raised to at least 4.0, the spoil will not support productive forest cover. In a small sample that included 93 sample points on 11 field plots that fell on spoil areas, 18 points had a pH below 4.0; 31 points were in the 4.0-5.0 range; 38 points were in the 5.0-6.5 range, and 6 points were above pH 6.5. The 4.0-5.0 range is minimally productive for trees; 5.0-6.5 is considered the optimum range for most species (Wilde 1958), and pH over 6.5 is too alkaline for good forest growth.

The revegetation requirements state that strip mines in the eastern field must be seeded within 15 days of grading. In the western field, where the erosion potential is less, the operator must seed within 45 days after grading. Trees must be planted at no less than 800 seedlings per acre, or seeded at the rate of 2 pounds of black locust seed per acre, on all disturbed areas except benches formed by contour mining, level areas created by mountaintop removal, and areas in western Kentucky that are approved for grasses and legumes only. The area above the highwall of any water impoundment must be planted with trees to provide

a protective barrier and screen. Acreage on which woody species are planted is declining, however, because many operators have been granted variances to plant grasses instead of trees. It has been estimated that in the past, about 75 percent of reclamation was to trees, but that now only about 25 percent of stripped areas are being revegetated with trees (personal communication, Willis G. Vogel). All roads must be seeded to legumes and permanent grasses. Certain amounts of fertilizer and mulch are also required. A high proportion of the vegetation planted must live at least two growing seasons before the State will release the operator's bond.

Technology related to revegetation of strip mines in the Appalachian coal fields is well advanced, and new technology for more effective reclamation is developing at a rapid rate (Plass 1975). Evaluation of the chemical and physical characteristics of overburden material before mining begins is suggested as the most reliable means of predicting spoil quality and devising a reclamation plan for achieving an appropriate land-management objective (Despard 1974).

Timber production can often be a realistic management objective on reclaimed strip mines. Pulpwood production has potential on certain stripped sites in Kentucky (Plass and Burton 1967). In some ways, strip mines offer advantages for timber production. Areas may be planted to preferred species because competition from undesirable vegetation will be minimal. Also, haul roads may provide access to establish, manage, protect, and harvest trees (Davis and Davidson 1968).

Wildlife production is also possible on properly reclaimed lands. Such areas may have small water impoundments; cultivated food strips; and complementary plantings of grasses, legumes, shrubs, and conifers (Davis and Davidson 1968). Strip mining often creates many miles of desirable "edge effects". Thus, while strip mining may create a short-term disruption in wildlife populations, it may have the long-term effect of increasing the diversity of wildlife species of the area. Some animals common to strip mines in various stages of reclamation are quail, rabbit, dove, deer, woodchuck, raccoon, and fox (Kays 1967). Mine roads provide access for hunter and nonhunter alike. When acid drainage is eliminated and when erosion is controlled, impoundments left on the reclaimed site may provide good fishing.

Besides the enjoyment of the fish and wildlife

resources, strip mines can be reclaimed for other recreational uses. Clean impoundments often make excellent swimming areas. The presence of water will attract campers and picnickers to mined areas that have been revegetated in an esthetically pleasing manner with trees and grasses.

Fish and Wildlife

Forests affect fish habitats in several beneficial ways. Shade lowers stream temperatures, improving the habitat for cold-water fish such as trout. Forests along streams and around reservoirs protect the waters and the fish in them by yielding surface and ground water at relatively stable rates, even during storms. Water from forested watersheds is generally free of sediment. Sediment is bad for fish—it kills insects and other preferred foods and decreases living space by filling pools. Also, areas that are forested to the edge of a stream stabilize streambanks. This improves fish habitat by reducing erosion. Trees left standing in reservoir areas before flooding, such as at Cave Run Lake, attract fish once the area is flooded. Improving fish habitat increases the numbers of larger and sportier fish.

Because of the influence of forests, the State has many waters providing good habitats for a varied fish population. Besides the 14,000 miles of

streams and rivers, Kentucky has 41 public fishing lakes—nearly 6,000 acres, many private lakes, more than 50,000 farm ponds, and 18 reservoirs with about 200,000 acres of water surface (SCORP 1975).

Kentucky is known for its good fishing. Of all forest-related recreational activities, fishing ranks first in the State. On Corps of Engineers reservoirs, nearly one-quarter of all recreational use is fishing. Figures supplied by the Kentucky Department of Fish and Wildlife Resources show that 5.6 million days per year are spent fishing, with fishermen spending about \$20.3 million per year. The fact that about 600,000 fishing licenses are sold yearly also attests to the widespread popularity of this activity. Since there is no closed season on angling, the fish resource of Kentucky can be enjoyed year round.

Because of the great demand for this resource, there is an active fish-stocking program. The State of Kentucky operates the Minor E. Clark Fish Hatchery at Cave Run Lake, and the U.S. Fish and Wildlife Service operates a National Fish Hatchery near Frankfort, and is constructing a National Trout Hatchery at Wolf Creek Dam that will reach full production in 1979. The two operating hatcheries released more than 3 million large mouth and small mouth bass, channel catfish,

Fishing in a wooded setting is a popular pastime for many in Kentucky.



Corps of Engineers' Photo.

bluegills, redbreasted sunfish, walleye, rockfish (striped bass), and muskellunge into the waters of Kentucky in 1975. Until the new trout hatchery is operating, Kentucky will continue to stock its 500 miles of suitable trout streams and deeper lakes, such as Cumberland and Laurel River, with trout from neighboring states. The Kentucky Department of Fish and Wildlife Resources estimates an annual harvest of 6 million pounds of fish, much of which originates in the ponds of several fish hatcheries.

The fish resources are not without problems. Pollution in the form of coal washings, mine acid, sediment, and oil spills account for significant fish kills each year. Except for coal-related pollutants, most of the agents harmful to fish originate in nonforest areas. With diligent efforts to reclaim strip mines properly and to control deep mine by-products, coal-related pollutants can be reduced to negligible levels.

Wildlife other than fish can be divided into two broad groups: nongame species and game species. Until recently, little attention was given nongame wildlife management. Besides filling essential ecological niches, nongame animals, as well as game species, provide significant recreational opportunities for the nonhunting public. On the Reelfoot National Wildlife Refuge in southwestern Kentucky, bird watching is a year-round activity. Long-range plans include the development of additional nature study trails, including a trail equipped with photographic blinds (SCORP 1975). John James Audubon, the famous ornithologist, came to Henderson, Kentucky, in 1818 because the town is on a major flyway. The State has established a park there in honor of this great naturalist.

A major thrust for the management of nongame species in Kentucky has been the protection of endangered and threatened species. Five species on the United States List of Endangered Species may be found in Kentucky at one time or another—the American peregrine falcon, the red-cockaded woodpecker, the Indiana bat, the southern bald eagle, and Kirtland's warbler. These species, most of which are in some way dependent on forest land, are protected, and destruction of their critical habitat is prohibited. Greater emphasis on wildlife management on the 11 million acres of privately owned commercial forest land is necessary to preserve this important resource.

Popular game species include squirrels, rabbits,

quail, grouse, deer, turkeys, raccoons, opossums, furbearers (hunted and trapped), doves, woodcock, geese, ducks, and frogs. These species are associated with forests to varying degrees; they range from waterfowl that need the clean water produced by forests to squirrels that depend exclusively on trees for food and shelter. Certain forest types are more favorable to some animals than are other types, primarily because of available food and cover. Even more important in determining desirable habitat is the stand-size and transition zones between different-size stands. Some species, like wild turkey, prefer mature and extensive hardwood stands. Others, like rabbit, are commonly found in scrubby seedling-and-sapling stands. Kentucky, with considerable acreages in all three stand sizes, is biologically capable of producing good populations of many kinds of game animals.

The wildlife resource of Kentucky has changed considerably since the 18th century when the State was covered with virgin hardwood forests. As an indication of the abundance of game, Dr. Thomas Walker, who in 1750 led an expedition into what is now Kentucky, reported that during the trip his party killed 13 buffalo, 8 elk, 53 bear, 20 deer, 4 geese, 150 turkeys, and many small game. He stated, "We might have killed three times as much game, had we wanted it" (Collins 1975). Among the species once common in the State that have since disappeared or become rare are the American bison, black bear, bobcat, beaver, elk, otter, panther, passenger pigeon, prairie chicken, and wolf. Habitat destruction, caused by clearing much forest land, along with uncontrolled hunting and trapping, led to the decline of these species (SCORP 1975).

The story of managing whitetailed deer in Kentucky demonstrates the success of cooperative efforts. Heavy hunting had, for all intents and purposes, eliminated the deer herd in Kentucky by 1880. Realizing the need to build up the deer population (as well as the populations of other game species) the Forest Service and the State entered into a cooperative agreement, and the Beaver Creek Wildlife Management Area was established in 1940, only 3 years after the Cumberland National Forest (now the Daniel Boone) came into being. The area encompassed 10,687 acres and has a wildlife population of: 0 deer, 0 turkeys, 40 grouse, 100 squirrels, 50 rabbits, 5 raccoons, 100 quail, and 20 opossum. Hunting was prohibited, suitable habitats were encouraged, and deer from

Forests support many popular game species including Kentucky's favorite—squirrel.



Kentucky Department of Fish and Wildlife Photos



western Kentucky were brought into the area. The Forest Service was responsible for protecting and managing the habitat, while the Kentucky Department of Fish and Wildlife Resources was responsible for protecting and managing the resident wildlife populations (Collins 1975). The Beaver Creek Area has been expanded to cover 15,000 acres, and another area, the Redbird River Wildlife Management Area—covering 19,000 acres—was added to this program. Two additional areas have been proposed. Latest estimates of a deer population of 120,000 for the State indicate the success of such programs.

Kentucky has 48 public hunting areas covering slightly more than 1 million acres, much of which is forested. Several public agencies carry out extensive wildlife management on many of these areas, but because of heavy hunting, these lands may be inferior to some privately owned lands. Thirty-four percent of private owners, who own 5 million acres of commercial forest land, allow hunting on their lands. Also, only 14 percent of all private owners post their 2.1 million acres of commercial forest land. Only 3 percent post land to control hunting, indicating weak antihunting sentiment among forest-land owners.

One unusual area is the 7,300 acre Pioneer Weapons Hunting Area on the Daniel Boone. This area was opened to bow hunting in 1955, and other primitive weapons such as crossbows, flintlock and percussion cap rifles, and muzzle-loading shotguns and pistols were permitted in 1962. All modern breech-loading firearms are excluded. Though hunter success is lower in this area, the popularity of this kind of hunting increases each year.

While hunting is not as popular as fishing, hunters spend an estimated 4,550,000 days pursuing game each year. More than 300,000 hunting licenses were sold in 1974, and hunters spend approximately \$13.2 million on this sport. Each year hunters kill approximately 5.1 million small game and 10,000 big game (deer and turkey). The fish and wildlife forest resources not only provide popular outdoor recreation to thousands of people, but they also supplement the larder of many a family.

Habitat destruction from activities such as industrial development, mining, and farming is a problem for Kentucky wildlife. Any activity that significantly reduces the amount of commercial forest land has a negative impact on the popula-

tions of nearly all wildlife species. Activities such as strip mining and reclamation, which cause only short-term destruction of habitat are preferable to irretrievable habitat loss from activities such as those caused by urban expansion.

Deer poaching is another serious problem, especially in eastern Kentucky. Poaching has reduced deer populations significantly, and is difficult to control. Law enforcement officers are too few, and they are sometimes even shot at when attempting to perform their duties. The solution to this problem seems to be public education. The Department of Fish and Wildlife Resources has an active information and education program using television, conservation magazines, and public discussions to inform people of this situation and suggest ways to bring it under control. Deer are also harassed and even killed by free-running dogs, though this is a minor problem compared to poaching.

Outdoor recreation

Outdoor recreation is an important use of forest land. It is a human experience that, when pursued in the forest, is dependent on the many other forest-related resources. Outdoor recreation is also the most people-oriented of all forest uses, with its benefits generally received directly. Forest recreation is now and will likely continue to be one of the most valuable uses of all our forest resources.

Most forest recreation occurs on lands administered by public agencies. Since there is a wide variety of experiences available, and since each agency places a different emphasis on recreation management, discussion of public forest recreation will center on the more dominant agencies. Figure 25 shows the distribution of public recreation areas with associated forest land in Kentucky.

The Kentucky Department of Parks administers 15 major resort parks and 13 recreational parks that offer recreational activities in a forest setting. This park system is recognized as one of the finest in the United States. While most of these parks draw people because of their excellent facilities rather than the forest resource itself, many forest- and water-oriented activities are available. They include nature study, hiking, fishing, boating, camping, picnicking, and horseback riding. Some parks are noted for their unique resources. One of these is Cumberland Falls, which is the largest waterfall, except for Niagara, east of the Rocky Mountains. Several parks have amphitheatres

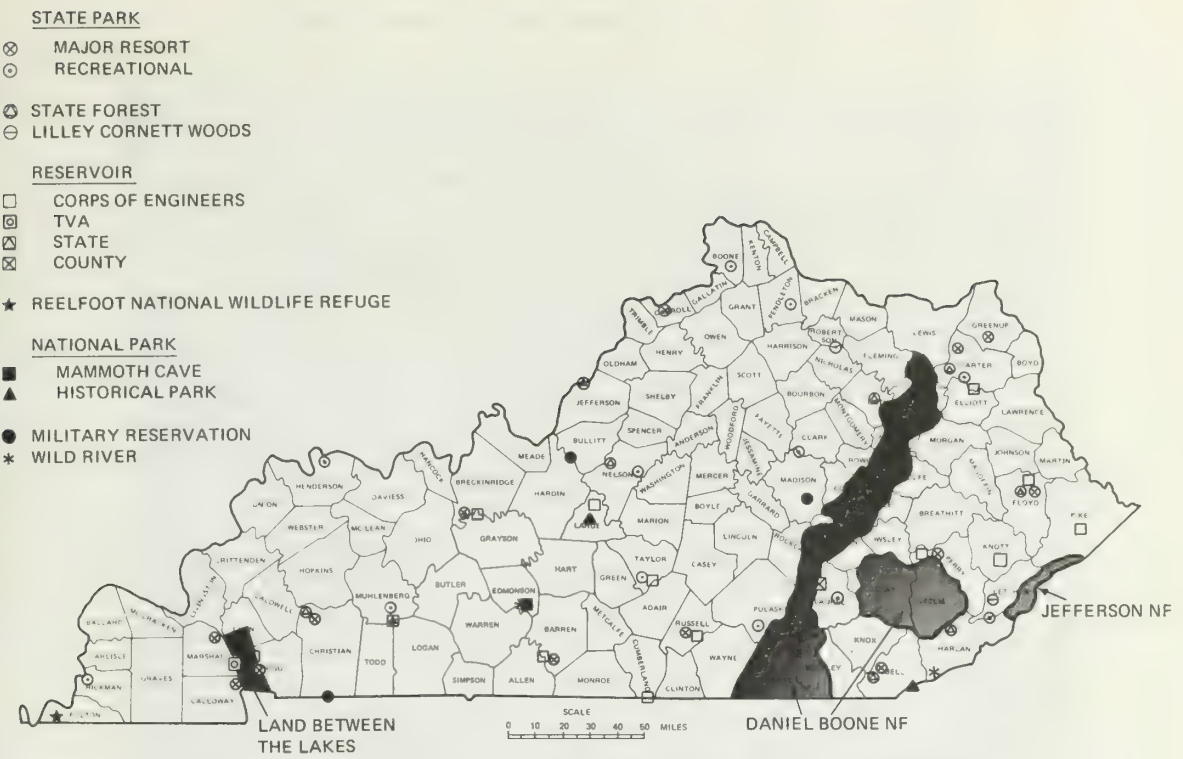


Figure 25.—Public recreation areas with associated forest land in Kentucky.

situated in forested environments where programs on the history and culture of Kentucky are offered.

The Kentucky Division of Forestry under the Department for Natural Resources and Environmental Protection administers eight state forests. While these forests are managed primarily for timber, people enjoy several recreational activities in these areas. Hiking and picnicking are probably most popular, followed by hunting, fishing, and camping. Because there is only one developed campground in the state forests, most camping is primitive. The three forests near state parks are also used by park visitors.

The same department administers Kentucky's eight wild rivers designated by the Wild Rivers Act of 1972. Six rivers are on Forest Service land and one runs through Mammoth Cave National Park. The streams are the Cumberland River from the summer shoals to the backwater of Lake Cumberland; Red River, Rockcastle River; Rock Creek; Green River; and the Big South Fork, Little South Fork, and Martin's Fork of the Cumberland River. These streams are free-flowing, esthetically

pleasing, and essentially free from the works of man. The areas include land no more than 2,500 feet from the center of the streams or to the visual horizon. Selective logging and existing farming are allowed on these lands while mining and construction of any impoundments, roads, or buildings are prohibited. These streams are accessible only by foot, horseback, canoe, and nonmotorized boat, so recreational use is limited.

The U.S. Army Corps of Engineers has built 14 multiple-purpose reservoirs in Kentucky, and administers 12 of these, in part, for forest-and water-related recreation. The lakes are popular since bodies of water associated with forest land are highly desirable recreation areas. Visitation figures provided by the Corps show that the major forest/water recreational activities rank as follows in participation: 1. sightseeing, 2. fishing, 3. boating and water-skiing, 4. camping, 5. swimming, and 6. picnicking.

The Tennessee Valley Authority administers Kentucky Lake and adjacent Land Between the Lakes (LBL) in western Kentucky. In this State, LBL covers about 106,000 acres, 90,000 (or 85

Kentucky's wild rivers flow through heavily forested areas of the State.



Kentucky Division of Forestry Photo.

percent) of which are forested. Except for the Daniel Boone National Forest, LBL is the largest publicly owned forest area in Kentucky. Begun in 1964, LBL is being developed as a national demonstration in outdoor recreation and environmental education. Besides the popular fishing, swimming, and boating activities associated with the lakes, LBL has an active program for group and family campers. Three modern campgrounds developed especially for family camping are avail-

able as are 26 areas for informal day activities or more primitive camping. Visitors are encouraged to hike the 126 miles of trails throughout LBL. Many of these are interpretive trails, and some demonstrate the benefits of proper natural resource management. There is also a Wranglers Camp for horseback riders. And, for the off-road vehicle enthusiast, there are 2,500 acres set aside for this use.

The Forest Service administers 588,800 acres of

commercial forest land in Kentucky, nearly all of which is in the Daniel Boone National Forest. While timber is the most important forest resource on the Forest, recreation is becoming increasingly important. In 1973, the Daniel Boone ranked 60th out of nearly 130 National Forests in the United States in recreational use. In 1974, the Forest was ranked 40th, and by 1975 it had climbed to 24th place. This dramatic increase in use is attributable, in large part, to the two reservoirs, Cave Run and Laurel River, recently impounded by the Corps.

Since the lakes are relatively new, many facilities are still being constructed, so the public has not begun to use these recreation sites to their full potential. Plans call for facilities such as information centers, paved roads, parking lots, flush toilets, two-family camping units, boat-launching ramps, beaches, and picnicking units. Nearly all forest recreational activities will be available when development is complete.

Another recent addition to the recreation spectrum of the Daniel Boone National Forest is an area designated by Congress in 1975 as Beaver Creek Wilderness. This area, covering about 5,000 acres, has been relatively undisturbed since the 1930's. It is isolated below a well-defined cliff line. These cliffs are the major scenic feature within the area; this area is also characterized by clear streams and immature stands of a variety of forest types. A few mature trees still stand in the steeper, narrow side hollows. The wilderness is also part of a wildlife-management area, so hunting is controlled. Other uses are backpacking and fishing. Streams were stocked by helicopter, but this method was discontinued because it disturbed the wilderness character of the area.

The Red River Gorge Geological Area in the Daniel Boone is a popular attraction. This unique landscape of 25,000 acres contains more than 40 natural arches and an unusual assortment of vegetation. The area is managed for protection of natural features, water, wildlife, and recreation. More than 40 miles of scenic drives and trails lead users to many overlooks, picnic areas, and dispersed campsites. The threat of a Corps reservoir flooding this area has lessened recently, though plans for the project have not been scrapped.

The relative popularity of various activities of the Daniel Boone reflects the more forested environment. In 1975, the major recreational activities, in order of participation, were: 1. sightseeing, 2. camping, 3. hiking and nature programs,

4. hunting, 5. boating, 6. fishing, and 7. picnicking.

Besides LBL, the National Forest is the only large public forest area with many trails. There are currently about 137 miles of trails; also planned is the development of a North-South Trail that would run the length of the major section of the Forest.

The National Park Service administers almost 58,000 acres of forest land on the Mammoth Cave National Park, the Cumberland Gap National Historical Park, and the Abraham Lincoln Birthplace National Historical Site. The Park Service emphasizes interpretation of the primary features of its parks, and most of its visitors are drawn to the main attractions. Mammoth Cave Park, besides its tour of the cave, offers guided nature walks, hiking trails, a campground, picnic tables, and evening campfire programs. Cumberland Gap's main attraction is an overlook offering a majestic view of forested mountains in three states: Kentucky, Virginia, and Tennessee. Besides sightseeing, back-country camping and hiking are popular, and good trout fishing is available. Outdoor activities at the Abraham Lincoln Birthplace are limited to nature walks and trails, and evening campfire programs.

As for forest recreation on privately owned land, 39 percent of the private owners—who control 5.7 million acres of commercial forest land—would allow some public use. Most of these owners would allow hunting, while hiking, picnicking, camping, and fishing were often mentioned as permissible activities. There are pockets of virgin timber on private land that have recreation potential, but these areas are not publicized because public notice would likely lead to the decline of this small but precious forest resource:

Recreation resource management is difficult because 455,600 private owners control 92 percent of the State's commercial forest land. It is difficult to manage a forest area large enough to be desirable for many activities if the land is controlled by many owners, all of whom may have different land-management objectives. This, coupled with the fact that recreation demands exceed supply, leads to the problem of too many people on too few acres of forest land.

Other problems include the conflicting uses of forest-related resources. Demand for areas for off-road vehicles is so great, for instance, that erosion of the forest soil resource concerns land man-

agers. This erosion also affects the associated water and timber resources. Another example is that no logging is allowed on state parks, so some stands are showing signs of deterioration due to heavy use and old age.

Though the forest-related resources have been discussed separately, it is obvious that they are all closely related. The fundamental tenet of ecology is that all components of any ecosystem are mutually dependent. In a forest, the various resources are intricately linked, as in a three-dimensional jigwaw puzzle. But unlike the rigid puzzle, the forest is dynamic. Trees die and are replaced by seedlings or sprouts. Soil erodes and is also built up by decaying litter. Coal is mined and the area is reclaimed. The examples are endless, but the point is clear—the forest is an ever changing amalgam of interrelated resources.

These individual resources, while important singly, only realize their greatest value when they are considered as integral parts of the whole. The problems affecting one resource subsequently affect the other resources. The solutions to these problems must begin with an understanding of these relationships.

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APPENDIX

Definition of terms

Acceptable trees. Growing-stock trees of commercial species that meet specified standards of size and quality, but do not qualify as desirable trees.

Annual net growth trend-level. The estimated growth of growing stock or sawtimber for a specific year that is consistent with the average annual growth during the period between surveys and with the current inventory. (1974 for Kentucky.)

Area condition class. A classification of commercial forest land based upon stocking of acceptable and desirable trees and other conditions affecting current and prospective timber growth.

Average annual ingrowth of growing stock. The net cubic-foot volume of trees now classed as growing stock that were less than 5.0 inches dbh on the previous survey, divided by the length of the period between surveys.

Average annual ingrowth of sawtimber. The net board-foot volume of trees now classed as sawtimber that were not tallied as such on the previous survey, divided by the length of the period between surveys.

Average annual mortality of growing stock. The net cubic-foot volume removed from the growing stock because of death from natural causes during the period between surveys, divided by the length of the period.

Average annual mortality of sawtimber. The net board-foot volume removed from sawtimber trees by death from natural causes during the period between surveys, divided by the length of the period.

Average annual net growth of growing stock. The change (resulting from natural causes) in volume of sound wood in sawtimber and pole-timber trees during the period between surveys, divided by the length of the period. Components of annual net growth of growing stock include the increment in net volume of trees present at the beginning of the period and surviving to its end, plus net volume of trees reaching pole-timber size during that period, minus the net volume of trees that died during the period, minus cull increment (the net volume of trees that became rough or rotten during the period).

Average annual net growth of sawtimber. The change (resulting from natural causes) in net

board-foot volume of sawtimber trees during the period between surveys, divided by the length of the period. Components of annual net growth of sawtimber include the increment in net volume of sawtimber trees present at the beginning of the period and surviving to its end, plus the net volume of trees reaching sawtimber size during the period, minus the net volume of sawtimber trees that died during the period, minus cull increment (the net volume of sawtimber trees that became rough or rotten during the period).

Average annual removals of growing stock. The net cubic-foot volume of growing-stock trees harvested or killed in logging, cultural operations such as timber-stand improvement, land-clearing, or changes in land use during the period between surveys, divided by the length of the period.

Average annual removals of sawtimber. The net board-foot volume of sawtimber trees harvested or killed in logging, cultural operations such as timber-stand improvement, land clearing, or changes in land use during the period between surveys, divided by the length of the period.

Basal area. The area in square feet of the cross section at breast height of a single tree, or of all trees in a stand, usually expressed as square feet per acre.

Board foot. A unit of lumber measurement 1 foot long, 1 foot wide, and 1 inch thick, or its equivalent.

Commercial forest land. Forest land producing or capable of producing crops of industrial wood (more than 20 cubic feet per acre per year) and not withdrawn from timber utilization.

Commercial species. Tree species presently or prospectively suitable for industrial wood products. Excludes species of typically small size, poor form, or inferior quality, such as hawthorn and sumac.

County and municipal lands. Lands owned by counties and local public agencies or municipalities or leased to them for 50 years or more.

Cull increment. The net volume of growing-stock trees on the previous inventory that became rough or rotten trees in the current inventory.

Desirable trees. Growing-stock trees of commercial species: (a) having no serious quality defects that limit present or prospective use for timber products; (b) of relatively high vigor, and (c) containing no pathogens that may result in death or serious deterioration before rotation age.

Diameter at breast height (dbh). The diameter

outside bark of a standing tree measured at 4 1/2 feet above the ground.

Farmer-owned lands. Lands owned by farm operators, whether part of the farmstead or not. Excludes land leased by farm operators from non-farm owners.

Federal lands. Lands (other than National Forests) administered by Federal agencies.

Forest industry lands. Lands owned by companies or individuals operating wood-using plants.

Forest land. Land stocked with at least 7.5 square feet of basal area per acre of any size forest trees or that formerly had such tree cover and is not currently developed for nonforest use. The minimum area for classification of forest land is 1 acre.

Forest trees. Woody plants that have well-developed stems and are usually more than 12 feet in height at maturity.

Forest type. A classification of forest land based upon the species forming a plurality of live tree stocking. The many forest types in Kentucky were combined into the following major forest type groups: (a) white and red pine—forests in which eastern white pine, red pine, or hemlock, singly or in combination, comprise a plurality of the stocking; in Kentucky this major type has only one local type—hemlock; common associates include hard pine, oak, maple, and yellow-poplar; (b) loblolly and shortleaf pine—forests in which loblolly, shortleaf, or other southern yellow pines except longleaf or slash pine, singly or in combination, comprise a plurality of the stocking; in Kentucky major species include eastern redcedar, Virginia pine, and shortleaf pine; (c) oak-pine—forests in which hardwoods (usually upland oaks) comprise a plurality of the stocking but in which pines comprise 25 to 50 percent of the stocking; (d) oak-hickory—forests in which upland oaks or hickory, singly or in combination, comprise a plurality of the stocking and in which pines comprise less than 25 percent of the stocking; in Kentucky common associates include hard pine, maple, beech, ash, yellow poplar, blackgum, and elm; (e) oak-gum—bottomland forests in which tupelo, blackgum, sweetgum, oak, or southern cypress, singly or in combination, comprise a plurality of the stocking and in which pines comprise less than 25 percent of the stocking; in Kentucky common associates include hickory, maple, yellow-poplar, and beech; (f) elm-ash-red maple—forests in which elm, ash, or red maple,

singly or in combination, comprise a plurality of the stocking; in Kentucky common associates include oak, hickory, river birch, yellow-poplar, and sycamore; (g) maple-beech-birch—forests in which sugar maple, beech, or yellow birch, singly or in combination comprise a plurality of the stocking; in Kentucky there is very little yellow birch; common associates include oak, hickory, yellow-poplar, and basswood.

Growing-stock trees. Live trees of commercial species classified as sawtimber, poletimber, saplings, and seedlings; that is, all live trees of commercial species except rough and rotten trees.

Growing-stock volume. Net volume, in cubic feet, of growing-stock trees 5.0 inches dbh and larger, from a 1-foot stump to a minimum 4.0-inch top diameter outside bark of the central stem, or to the point where the central stem breaks into limbs. Net volume equals gross volume less deduction for cull.

Hardwoods. Dicotyledonous trees, usually broad-leaved and deciduous.

Industrial wood. All roundwood products except fuelwood.

International 1/4-inch rule. A log rule, or formula, for estimating the board-foot volume of logs. The mathematical formula is: $\{D^2 \times 0.22\} - 0.71 D\} \times 0.904762$ for 4-foot sections, where D = diameter inside bark at the small end of the section. This rule is used as the USDA Forest Service Standard Log Rule in the eastern United States.

Land area. (a) Bureau of Census: the area of dry land and land temporarily or partly covered by water, such as marshes, swamps, and river flood plains; streams, sloughs, estuaries, and canals less than one-eighth statute mile wide; and lakes, reservoirs, and ponds less than 40 acres in area; (b) Resources Evaluation: same as (a), except that the minimum width of streams, etc., is 120 feet, and the minimum size of lakes, etc., is 1 acre.

Logging residues. The unused growing-stock volume of trees cut for products and the total growing-stock volume of trees destroyed in the course of logging but not removed for products.

Miscellaneous private lands. Privately-owned lands other than forest-industry and farmer-owned lands.

National forest lands. Federal lands legally designated as National forests or purchase units and other lands administered as part of the National Forest System by the Forest Service.

Noncommercial forest land. Unproductive and productive-reserved forest land.

Noncommercial species. Tree species of typically small size, poor form, or inferior quality that normally do not develop into trees suitable for industrial wood products.

Nonforest land. Land that has never supported forests, or land formerly forested but now in non-forest use such as crops, improved pasture, residential areas.

Nonstocked areas. Commercial forest land that has less than 12.5 square feet of basal area per acre of growing-stock trees.

Other removals. The growing-stock volume of trees that were removed from the inventory and not used for products by cultural operations (weeding, thinning, etc.), land clearing, or reclassification of some commercial forest land as noncommercial forest land.

Plant byproducts. Wood products, such as slabs, edgings, and veneer cores, obtained incidental to production of timber products and utilized in the manufacture of other timber products. (Bark is not included.)

Plant residues. Wood material produced incidental to production of timber products but not utilized.

Poletimber stands. Stands stocked with at least 12.5 square feet of basal area per acre of growing stock with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of poletimber exceeds that of sawtimber.

Poletimber trees. Live trees of commercial species meeting regional specifications of soundness and form and at least 5.0 inches in dbh but smaller than sawtimber size.

Productive-reserved forest land. Forest land sufficiently productive to qualify as commercial forest land, but withdrawn from timber utilization through statute, administrative designation, or exclusive use for Christmas-tree production.

Rotten trees. Live trees of commercial species that do not contain at least one 12-foot sawlog or two noncontiguous sawlogs, each 8 feet or longer, now or prospectively, and do not meet regional specifications for freedom from defect primarily because of rot; that is, when more than 50 percent of the cull volume in a tree is rotten.

Rough trees. (a) The same as rotten trees, except that rough trees do not meet regional specifications for freedom from defect primarily because

of roughness or poor form, and (b) all live trees of noncommercial species.

Roundwood products. Logs, bolts, or other round sections cut from growing stock or non-growing stock for industrial or nonindustrial uses.

Saplings. Live trees 1.0 through 4.9 inches in dbh.

Sapling-seedling stands. Stands stocked with at least 12.5 square feet of basal area per acre of growing stock with half or more of such stocking in saplings or seedlings or both.

Sawlog. A log meeting minimum standards of diameter, length, and defect, including logs at least 8 feet long, and with a minimum diameter inside bark of 6 inches for softwoods and 8 inches for hardwoods. (See specifications under Log Grade Classification.)

Sawlog portion. That part of the bole of a sawtimber tree between the stump and the sawlog top; that is, the merchantable height.

Sawlog top. The point on the bole of a sawtimber tree above which a sawlog cannot be produced. The minimum sawlog top is 7.0 inches in diameter outside bark (dob) for softwoods and 9.0 inches in dob for hardwoods.

Sawtimber stands. Stands stocked with at least 12.5 square feet of basal area per acre of growing stock with half or more of such stocking in poletimber or sawtimber trees or both, and in which the stocking of sawtimber is at least equal to that of poletimber.

Sawtimber trees. Live trees of commercial species at least 9.0 inches in dbh for softwoods or 11.0 inches for hardwoods containing at least one 12-foot sawlog or two noncontiguous 8-foot sawlogs and meeting regional specifications for freedom from defect.

Sawtimber volume. Net volume in board feet, International 1/4-inch rule, of sawlogs in sawtimber trees. Net volume equal gross volume less deductions for rot, sweep, and other defects that affect use for lumber.

Seedlings. Live trees less than 1.0 inch in dbh that are expected to survive.

Site class. A classification of forest land in terms of inherent capacity to grow crops of industrial wood. Classifications are based upon the mean annual growth of growing stock attainable in fully stocked natural stands at culmination of mean annual growth.

Softwoods. Coniferous trees, usually evergreen, having needles or scale-like leaves.

Stand. A group of forest trees growing on forest land.

Stand-size class. A classification of forest land based on the size class; that is, seedlings, saplings, poletimber or sawtimber of growing-stock trees on the area.

Standard cord. A unit of measure for stacked bolts of wood, encompassing 128 cubic feet of wood, bark, and air space. Cord estimates can be derived from cubic-foot estimates of growing stock by applying an average factor of 80 cubic feet of wood (inside bark) per cord. (Except for pulpwood where a conversion of 85 cubic feet/cord is used because of the more uniform character of pulpwood.)

State lands. Lands owned by the Commonwealth of Kentucky or leased to the State for 50 years or more.

Stocking. The degree of occupancy of land by trees, measured in terms of basal area of trees in a stand compared to the basal area of trees required to fully utilize the growth potential of the land (or the stocking standard). This standard, in the eastern states, is 75 square feet of basal area per acre. The level of stocking, from a management perspective, is seen as a range of values rather than single points. An overstocked stand is stocked with at least 130 percent of the basal-area standard. A fully stocked stand lies within the range of 100 to 130 percent stocked. A medium stocked stand is between 60 to 100 percent stocked. A poorly stocked stand is below 60 percent stocked.

Three categories of stocking are used:

- All live trees—these are used to classify forest land and forest types.
- Growing-stock trees—these are used to classify stand-size classes and area-condition classes.
- Desirable trees—these are used to classify area-condition classes.

Timber products. Roundwood products and plant byproducts from all sources.

Timber removals. The growing-stock volume of trees removed from the inventory for roundwood products, plus logging residues and other removals.

Unproductive forest land. Forest land that is incapable of producing 20 cubic feet per acre per year of industrial wood under natural conditions, because of adverse site conditions.

Upper-stem portion. That part of the main stem or fork of a sawtimber tree above the sawlog top to a diameter of 4.0 inches outside bark or to the

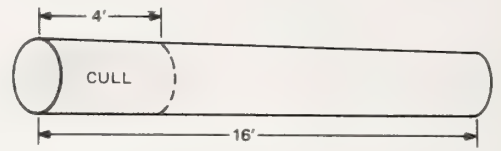
point where the main stem or fork breaks into limbs.

Log-grade classification

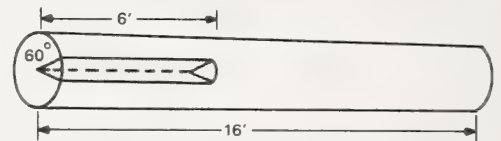
Log grades are a classification of logs based on external characteristics as indicators of quality or value. The log-grade standards and grading systems for softwoods and hardwoods used in this forest survey of Kentucky are shown in the following specifications:

Methods of determining scaling deduction.

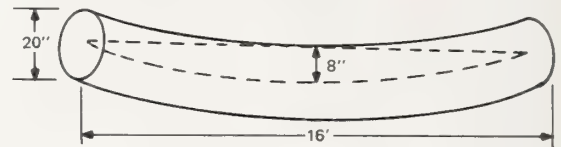
(Examples based on a 16-foot log with 20-inch scaling diameter)



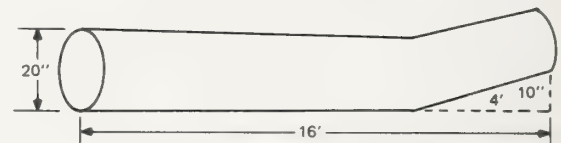
Defect section (rule 1): Percent deduction = $\frac{4}{16} = 25\%$



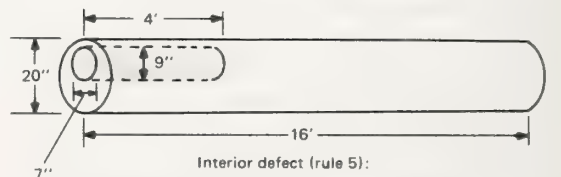
Defect section (rule 2): Percent deduction = $\left(\frac{6}{16}\right) \left(\frac{60}{360}\right) = 6\text{-}1/4\%$



Sweep (rule 3): Percent deduction = $\frac{8-2}{20} = 30\%$



Crook (rule 4): Percent deduction = $\left(\frac{10}{20}\right) \left(\frac{4}{16}\right) = 12\text{-}1/2\%$



Interior defect (rule 5):
Percent deduction = $\frac{(8)(10)}{(20-1)^2} \times \frac{4}{16} = 5\text{-}5/9\%$

In practice each ellipse axis can be divided by (20-1)

Thus $\frac{8}{19} = .4$, $\frac{10}{19} = .5$, and $(.4)(.5) \left(\frac{4}{16}\right) = 5\%$

From: Gosenbaugh, L.R. 1952. Shortcuts for cruisers and scalers. U.S. Dep. Agric. For. Serv. South. For. Exp. Stn. Occas. Pap. 126.

SPRUCE, FIR, HEMLOCK, TAMARACK, AND CEDAR LOG GRADE
(Minimum merchantability specifications)

Log grade	Minimum size		Defect allowance		Other requirements
	Diameter ¹	Length ²	Sweep or crook	Total deduction	
	Inches	Feet	Percent	Percent	
1	10-12	8-16 in 2-foot multiples	25	50	Sound knots not over 2 inches in diameter permitted. Shake permitted up to 20 percent of gross scale if not combined with other serious defects.
	13 +	8-16 in 2-foot multiples	25	50	Sound knots not over 3 inches in diameter permitted. Shake permitted up to 20 percent of gross scale if not combined with other serious defects.

¹At small end of log.

²Without trim.

SOUTHERN PINE SAWLOGS

Grade 1. Logs with 3 or 4 clear faces.¹ Code 1.

Grade 2. Logs with 1 or 2 clear faces. Code 2.

Grade 3. Logs with no clear faces. Code 3.

After the tentative log grade is established from above, the log will be degraded one grade for each of the following, except that no log can be degraded below grade 3.

1. *Sweep.* Degrade any tentative 1 or 2 log one grade if sweep amounts to 3 or more inches and equals or exceeds one third (1/3) the diameter inside bark at small end. This is the final grade if there is no evidence of heart rot.

2. *Heart rot.* Degrade any tentative 1 or 2 log one grade if conk, massed hyphae, or other evidence of advanced heart rot is found anywhere in it.

¹ A face is one-fourth of the circumference in width extending full length of the log. Clear faces are those free of: knots measuring more than one-half inch in diameter, overgrown knots of any size, holes more than one-fourth inch in diameter. The faces may be rotated if necessary to obtain the maximum number of clear ones.

STANDARD GRADES FOR HARDWOOD FACTORY LUMBER LOGS.^a

Grading Factors		Log grades							
		F1			F2				F3
Position in tree		Butts only	Butts & uppers		Butts & uppers				Butts & uppers
Scaling diameter, inches		13-15 ^b	16-19	20 +	11 + ^c	12 +			8 +
Length without trim, feet		10 +			10 +	8-9	10-11	12 +	8 +
Required clear cuttings ^d of each of 3 best faces ^e	Min. length, feet	7	5	3	3	3	3	3	2
	Max. number	2	2	2	2	2	2	3	No limit
	Min. proportion of log length required in clear cutting	5/6	5/6	5/6	2/3	3/4	2/3	2/3	1/2
Maximum sweep & crook allowance	For logs with less than 1/4 of end in sound defects	15%			30%				50%
	For logs with more than 1/4 of end in sound defects	10%			20%				35%
Maximum scaling deduction		40% ^f			50% ^g				50% ^h

End defects, although not visible in standing trees, are important in grading cut logs. Instructions for dealing with this factor are contained in Forest Prod. Lab. Rpt. D 1737.

^aFrom USDA Forest Service Research Paper FPL-63 (13).

^bAsh and basswood butts can be 12 inches if they otherwise meet requirements for small #1's.

^cTen-inch logs of all species can be #2 if they otherwise meet requirements for small #1's.

^dA clear cutting is a portion of a face, extending the width of the face, that is free of defects.

^eA face is 1/4 of the surface of the log as divided lengthwise.

^fOtherwise #1 logs with 41-60% deductions can be #2.

^gOtherwise #2 logs with 51-60% deductions can be #3.

STANDARD SPECIFICATIONS FOR HARDWOOD CONSTRUCTION LOGS.^a

Position in tree		Butt & upper
Min. diameter, small end		8 inches +
Min. length, without trim		8 feet
Clear cuttings		No requirements.
Sweep allowance, absolute		1/4 diameter small end for each 8 feet of length.
Sound surface defects	Single knots	Any number, if no one knot has an average diameter above the callus in excess of 1/3 of log diameter at point of occurrence.
	Whorled knots	Any number if sum of knot diameters above the callus does not exceed 1/3 of log diameter at point of occurrence.
	Holes	Any number provided none has a diameter over 1/3 of log diameter at point of occurrence, and none extends over 3 inches into included timber. ^b
Unsound surface defects		Same requirements as for sound defects if they extend into included timber. ^b No limit if they do not.
End defects	Sound	No requirements.
	Unsound	None allowed; log must be sound internally, but will admit 1 shake not to exceed 1/4 the scaling diameter and a longitudinal split not extending over 5 inches into the contained timber.

^aThese specifications are minimum for the class. If, from a group of logs, factory logs are selected first, thus leaving only non-factory logs from which to select construction logs, then the quality range of the construction logs so selected is limited, and the class may be considered a grade. If selection for construction logs is given first priority, then it may be necessary to subdivide the class into grades.

^bIncluded timber is always square, and dimension is judged from small end.

From: Rast, E. D., D. L. Sonderman, and G. L. Gammon, A GUIDE TO HARDWOOD LOG GRADING (REVISED). USDA For. Serv. Gen. Tech. Rep. NE-1, 1973.

Forest Survey methods

The Resources Evaluation unit of the North-eastern Forest Experiment Station used the sampling with partial replacement (SPR) design in the reinventory of the timber resource of Kentucky. With this design, estimates of forest area and timber volume were made by combining a regression updating of the previous inventory based on a subsample of remeasured plots and a new independent photo- and ground-plot inventory. Thus the SPR design, by combining two independent estimates of the inventory, yields a statistically more accurate estimate of the timber resource than other methods at the same cost.

Remeasurement

One estimate is based on the updating of the 1963 survey. This required the remeasurement of 1,062 second-inventory ground plots. With the area-change and current volume estimates obtained from the remeasurement sample plots, regression techniques were used to update the 1963 inventory to obtain an independent estimate of current timber volume and forest area.

In addition to estimating current timber volume and forest area, the survey was designed to obtain an estimate of the components of average annual change during the period between the second and third inventories. These components include area

change from forest to nonforest and vice versa, timber growth, timber removals, and timber mortality. All this information was obtained from the remeasured plots. The timber-change components were obtained by a tree-by-tree reconciliation on each remeasured plot. The reconciliation code for each remeasured tree was used to make estimates of the components of change, by species. These estimates were expressed as average annual figures by dividing the totals for the period by the number of years between measurements. They were then used in the computations of annual net growth, mortality, and removals for 1974.

New-ground phase

The source of the new independent estimates of volume and forest area was a new aerial-photo stratification with a subsample of ground measurements. This photo sample of Kentucky consisted of 38,268 points on the latest available aerial photography. A subset of 1,538 of these photo plots (including 996 on forest land, 536 on nonforest land, and 6 on nonproductive land) was located on the ground. Land use was verified and tree-measurement data were recorded on the forested plots. These plots consisted of a cluster of 10 prism points systematically arranged to cover approximately 1 acre. At each point, trees were selected for tally by using a prism with a basal-area factor of 37.5. Area-attribute data were also tallied at each of the 10 points.

County data

Many users of resources evaluation data need county information. To provide such information, within the framework of the survey design, tables for counties have been developed, based on a survey-unit partitioning technique.

First, the geographic stratum means and variances for the various photo-plot strata were applied to the photo-plot data for each county within the stratum. This yielded an estimate of total volume or total commercial forest-land area for each county. Second, the data from all the new ground plots in each geographic stratum were used to partition the county totals into their various components. For example, if a table of cubic-foot volume by softwoods and hardwoods is to be made for a county, the estimate of total cubic-foot volume for that county is partitioned into softwood and hardwood totals according to the proportion of softwoods and hardwoods for all new

Resources Evaluation ground plots within the geographic stratum.

Comparisons between inventories

After inventories have been completed for several points in time, it is desirable to evaluate the trends between the inventories and to make comparisons. A comparison of the 1949, 1963, and 1975 Resources Evaluation estimates of volume, growth, removals, and mortality was made for Kentucky. A computer program, TRAS (timber resource analysis system) was used.

Because of changes in procedures and in definitions, it was necessary to adjust the 1949 and 1963 inventory-volume estimates to what they would have been had the 1975 procedures and definitions been used. An important step in this process was to recalculate the 1949 and 1963 inventory volumes, using the average net volume per tree developed by the third inventory. To do this, the average net volume per tree (for softwoods and hardwoods) developed from the third survey for each 2-inch diameter class was multiplied by the number of trees in each 2-inch diameter class from the 1949 and 1963 inventories. *These adjusted estimates, not the estimates published in the reports of the earlier surveys, are the basis for comparisons between surveys shown in this report.*

Data processing

Field-tally data consisting of plot and individual-tree information were processed and compiled into tables using FINSYS—Forest Inventory System—on modern, large-capacity, high-speed computers.

FINSYS is a data-processing system consisting primarily of a series of computer programs developed by the Northeastern Forest Experiment Station to process and compile a large volume of forest-inventory data. The system consists of an editing subsystem that edits field-tally data for errors; a table-compiling subsystem that compiles tables from edited field data; and an output subsystem that expands the plot data to geographic unit or statewide estimates and prints the final tables.

FINSYS was described in a series of research papers by R. W. Wilson and R. C. Peters in 1967: *The Northeastern Forest Inventory Data Processing System*, USDA Forest Service Research Papers NE-61 and NE-70 to 80.

FINSYS has several features that make it

unique. One of these is its flexibility. The system is not restricted to the Northeastern forest survey but can be used for any large-scale forest inventory. Also, the system does not produce a standard set of tables. The user specifies the tables that he desires. Thus at any stage in the data-processing phase, or at a later date, a specific table can be developed with minimum effort.

Another feature of FINSYS is its ability not only to calculate inventory estimates but also to calculate the variance and sampling error for each estimate. This feature provides the user with a measure of the reliability of each statistic, and the ability to determine the reliability of a new estimate based on any data combination.

Reliability of the estimates

The forest-area and timber-volume data presented in this report were based upon a carefully designed sample of forest conditions throughout Kentucky. However, since neither every acre nor every tree in the State was measured, the data presented in this report are estimates. A measure of the reliability of these estimates is given by a sampling error. An associated

sampling error was calculated for each estimate in this report. Many of these appear in the data tables.

Here is an example of how to use sampling errors. The total growing-stock volume estimate of Kentucky, 11,444 million cubic feet, is our best estimate. It has an associated sampling error of 1.1 percent, or 126 million cubic feet. This means that if there are no errors in procedure, the odds are 2 to 1 that if we repeated the survey in the same way, the resulting estimate of growing-stock volume would be between 11,318 million cubic feet and 11,570 million or $11,444 \pm 126$. Similarly, the odds are 19 to 1 that it would be within ± 252 and 300 to 1 that it would be within ± 378 million cubic feet.

The computed sampling error is not a complete measure of reliability. There are other sources of error that this term does not include. There could be imperfections in volume tables and equations and errors in field measurement. Procedural errors were kept to a minimum by careful training of all personnel, frequent inspection of field work, and application of the most reliable survey methods.

Commercial tree species of Kentucky

Occurrence ¹	Common Name	Scientific Name ²
Softwoods		
c	Eastern redcedar	<i>Juniperus virginiana</i>
c	Shortleaf pine	<i>Pinus echinata</i>
c	Pitch pine	<i>P. rigida</i>
vr	Eastern white pine	<i>P. strobus</i>
vr	Scotch pine ³	<i>P. sylvestris</i>
r	Loblolly pine ³	<i>P. taeda</i>
c	Virginia pine	<i>P. virginiana</i>
vr	Baldcypress	<i>Taxodium distichum</i> var. <i>distichum</i>
vc	Eastern hemlock	<i>Tsuga canadensis</i>
Hardwoods		
vc	Red maple (soft) ⁴	<i>Acer rubrum</i>
r	Silver maple	<i>A. saccharinum</i>
vc	Sugar maple (hard) ⁴	<i>A. saccharum</i>
r	Buckeye	<i>Aesculus</i> spp.
vr	Yellow birch	<i>Betula alleghaniensis</i>
r	Sweet birch (black) ⁴	<i>B. lenta</i>
r	River birch	<i>B. nigra</i>
vc	Hickory	<i>Carya</i> spp.
r	American chestnut	<i>Castanea dentata</i>
c	Hackberry	<i>Celtis occidentalis</i>
vc	Flowering dogwood	<i>Cornus florida</i>
c	Common persimmon	<i>Diospyros virginiana</i>

c	American beech	<i>Fagus grandifolia</i>
c	White ash	<i>Fraxinus americana</i>
vr	Black ash	<i>F. nigra</i>
c	Green ash	<i>F. pennsylvanica</i>
vr	Blue ash	<i>F. quadrangulata</i>
r	Honeylocust	<i>Gleditsia triacanthos</i>
vr	Kentucky coffeetree	<i>Gymnocladus dioicus</i>
r	American holly	<i>Ilex opaca</i>
r	Butternut	<i>Juglans cinerea</i>
c	Black walnut	<i>J. nigra</i>
c	Sweetgum	<i>Liquidambar styraciflua</i>
vc	Yellow-poplar	<i>Liriodendron tulipifera</i>
r	Magnolia	<i>Magnolia</i> spp.
c	Black tupelo (blackgum) ⁴	<i>Nyssa sylvatica</i>
c	American sycamore	<i>Platanus occidentalis</i>
r	Eastern cottonwood	<i>Populus deltoides</i>
vr	Bigtooth aspen	<i>P. grandidentata</i>
c	Black cherry	<i>Prunus serotina</i>
vc	White oak	<i>Quercus alba</i>
vr	Swamp white oak	<i>Q. bicolor</i>
c	Scarlet oak	<i>Q. coccinea</i>
vr	Northern pin oak	<i>Q. ellipsoidalis</i>
c	Southern red oak	<i>Q. falcata</i> var. <i>falcata</i>
r	Cherrybark oak	<i>Q. falcata</i> var. <i>pagodaefolia</i>
r	Shingle oak	<i>Q. imbricaria</i>
vr	Overcup oak	<i>Q. lyrata</i>
vr	Bur oak	<i>Q. macrocarpa</i>
r	Swamp chestnut oak	<i>Q. michauxii</i>
c	Chinkapin oak	<i>Q. muehlenbergii</i>
r	Pin oak	<i>Q. palustris</i>
r	Willow oak	<i>Q. phellos</i>
c	Chestnut oak	<i>Q. prinus</i>
c	Northern red oak	<i>Q. rubra</i>
r	Shumard oak	<i>Q. shumardii</i> var. <i>shumardii</i>
c	Post oak	<i>Q. stellata</i> var. <i>stellata</i>
vc	Black oak	<i>Q. velutina</i>
c	Black locust	<i>Robinia pseudoacacia</i>
r	Black willow	<i>Salix nigra</i>
c	Basswood	<i>Tilia</i> spp.
c	Winged elm	<i>Ulmus alata</i>
c	American elm	<i>U. americana</i>
c	Slippery elm	<i>U. rubra</i>
r	Rock elm	<i>U. thomasii</i>

¹ Occurrence is based on the frequency of tally of commercial species on forest survey field plots: vr—very rare (<0.05%), r—rare (0.05-0.49%), c—common (0.5-4.9%), and vc—very common (≥5.0%).

² Names according to: Little, Elbert L., Jr. Checklist of native and naturalized trees of the United States (including Alaska). U.S. Dep. Agric. Handb. 41, 472 p. 1953.

³ Species introduced into Kentucky.

⁴ Names in parentheses are other frequently used common names.

TIMBER VOLUME

- 47 Class of timber and geographic unit
- 48 Growing stock and sawtimber, by ownership class and geographic unit
- 49 Growing stock and sawtimber, by stand-size class and geographic unit
- 50 Growing stock and sawtimber, by forest type group and geographic unit
- 51 Growing stock in the Western Unit, by species and diameter class
- 52 Growing stock in the Western Coalfield Unit, by species and diameter class
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- 54 Growing stock in the Bluegrass Unit, by species and diameter class
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Table 1.—Area by land class, Kentucky, 1975

Land class	Area	
	<i>Thousand acres</i>	<i>Percent</i>
Forest land		
Commercial	11,901.9	47
Productive reserved	212.8	1
Unproductive	46.1	(^a)
Total forest land	12,160.8	48
Nonforest land		
Cropland ^b	4,527.9	18
Pasture ^b	6,774.9	26
Other ^c	2,041.2	8
Total nonforest land	13,344.0	52
Total area ^d	25,504.8	100

^a Less than 0.5 percent.

^b Census of Agriculture 1969.

^c Includes swampland, industrial and urban areas, other non-forest lands, and 50,550 acres, classed as water by Forest Survey standards, but defined by the Bureau of the Census as land.

^d Source: United States Bureau of the Census, Area of Kentucky, 1960 (July 1964).

Table 2.—Area of commercial forest land, by ownership class, Kentucky, 1975

Ownership class	Area	
	<i>Thousand acres</i>	<i>Percent</i>
National forest	588.8	5
Other Federal	229.9	2
State	76.0	1
County and municipal	.6	(^a)
Total public	895.3	8
Forest industry	255.1	2
Farmer-owned	5,489.0	46
Miscellaneous private:		
Individual	4,431.8	37
Corporate	830.7	7
Total private	11,006.6	92
All ownerships	11,901.9	100

^a Less than 0.5 percent.

Table 3.—Area of commercial forest land, by stand-size and ownership class, Kentucky, 1975

(In thousands of acres)

Stand-size class	All ownerships	National forest	Other public	Forest industry	Farmer and other
Sawtimber stands	5,544.3	413.1	115.8	71.9	4,943.5
Poletimber stands	3,006.1	148.2	120.5	150.5	2,586.9
Sapling-seedling stands	3,305.3	27.5	70.2	32.7	3,174.9
Nonstocked areas	46.2	—	—	—	46.2
All classes	11,901.9	588.8	306.5	255.1	10,751.5

Table 4.—Area of commercial forest land, by stand-volume and ownership class, Kentucky, 1975

(In thousands of acres)

Stand-volume per acre (board feet) ^a	All ownerships	National forest	Other public	Forest industry	Farmer and other
Less than 1,500	4,391.1	84.7	127.9	74.3	4,104.2
1,500 to 5,000	5,602.5	374.8	161.6	159.4	4,906.7
More than 5,000	1,908.3	129.3	17.0	21.4	1,740.6
All classes	11,901.9	588.8	306.5	255.1	10,751.5

^a International 1/4-inch rule.

Table 5.—Area of commercial forest land, by stocking class based on selected stand components, Kentucky, 1975

(In thousands of acres)

Stocking class ^a (percent)	Stocking classified in terms of—				Rough and rotten trees
	All trees	Growing-stock trees		Acceptable	
		Total	Desirable		
160	14.9	—	—	—	—
150 to 159	161.2	36.5	—	36.5	—
140 to 149	601.3	90.1	—	59.5	—
130 to 139	2,002.8	299.8	—	264.8	—
Overstocked	2,780.2	426.4	—	360.8	—
120 to 129	2,505.5	894.3	—	728.8	—
110 to 119	2,763.7	1,457.7	—	1,323.9	—
100 to 109	1,786.9	2,209.6	—	2,121.7	—
Fully stocked	7,056.1	4,561.6	—	4,174.4	—
90 to 99	1,114.8	2,209.3	—	2,318.8	28.2
80 to 89	376.1	1,766.7	—	1,861.3	11.8
70 to 79	267.8	1,126.1	—	1,235.0	61.4
60 to 69	85.2	811.9	12.5	863.9	130.1
Medium stocked	1,843.9	5,914.0	12.5	6,279.0	231.5
50 to 59	54.6	491.7	—	554.2	443.9
40 to 49	47.4	222.6	—	247.9	978.5
30 to 39	65.8	157.8	12.5	157.8	1,556.4
20 to 29	42.1	81.7	140.6	81.7	2,821.0
10 to 19	11.8	12.5	800.3	—	3,388.6
0 to 9	—	33.6	10,936.0	46.1	2,482.0
Poorly stocked	221.7	999.9	11,889.4	1,087.7	11,670.4
All classes	11,901.9	11,901.9	11,901.9	11,901.9	11,901.9

^a 100 percent stocking equals 75 square feet of basal area per acre.

Table 6.—Area of commercial forest land, by area-condition and ownership class, Kentucky, 1975

(In thousands of acres)

Area-condition class ^a	All ownerships	National forest	Other public	Forest industry	Farmer and other
Class 10-50	4,320.9	364.4	145.3	46.0	3,765.2
Class 60	6,465.7	201.5	136.5	198.6	5,929.1
Class 70	1,115.3	22.9	24.7	10.5	1,057.2
All classes	11,901.9	588.8	306.5	255.1	10,751.5

^a Class 10-40.—Areas medium to fully stocked with desirable trees.

Class 50.—Areas poorly stocked with desirable trees, but fully stocked with growing-stock trees.

Class 60.—Areas poorly stocked with desirable trees, but with medium to full stocking of growing-stock trees.

Class 70.—Areas poorly stocked with desirable trees, and poorly stocked with growing-stock trees.

Table 7.—Area of commercial forest land, by potential site productivity and ownership class, Kentucky, 1975

(In thousands of acres)

Growth-per-acre class (cubic feet)	All ownerships	National forest	Other public	Forest industry	Farmer and other
120 to 165	922.7	25.7	9.1	—	887.9
85 to 120	3,043.7	241.0	30.2	53.7	2,718.8
50 to 85	4,945.6	194.8	160.6	163.9	4,426.3
Less than 50	2,989.9	127.3	106.6	37.5	2,718.5
All classes	11,901.9	588.8	306.5	255.1	10,751.5

Table 8.—Area of commercial forest land, by forest type group and ownership class, Kentucky, 1975

(In thousands of acres)

Forest type group	All ownerships	National forest	Other public	Forest industry	Farmer and other
White and red pine	38.2	15.2	—	—	23.0
Loblolly and shortleaf pine	942.8	44.1	9.1	—	889.6
Oak/pine	1,040.6	85.8	15.3	—	939.5
Oak/hickory	7,488.5	360.7	248.4	225.3	6,654.1
Oak/gum	101.6	—	—	—	101.6
Elm/ash/red maple	936.0	7.7	24.7	—	903.6
Maple/beech/birch	1,354.2	75.3	9.0	29.8	1,240.1
All types	11,901.9	588.8	306.5	255.1	10,751.5

Table 9.—Area of commercial forest land, by forest type group and stand-size class, Kentucky, 1975

(In thousands of acres)

Forest type group	All stands	Sawtimber stands	Poletimber stands	Sapling-seedling stands ^a
White and red pine	38.2	38.2	—	—
Loblolly and shortleaf pine	942.8	281.4	157.6	503.8
Oak/pine	1,040.6	335.8	215.6	489.2
Oak/hickory	7,488.5	3,622.6	2,183.3	1,682.6
Oak/gum	101.6	57.6	19.2	24.8
Elm/ash/red maple	936.0	288.0	212.9	435.1
Maple/beech/birch	1,354.2	920.7	217.5	216.0
All types	11,901.9	5,544.3	3,006.1	3,351.5

^a Includes 46,200 acres of nonstocked areas in the oak/hickory type group.

Table 10.—Area of commercial forest land by forest type and forest type group, Kentucky 1975

(In thousands of acres)

Forest type and forest type group	Area	Sampling error
	<i>Thousand acres</i>	<i>Percent</i>
Hemlock	38.2	*
TOTAL WHITE AND RED PINE	38.2	*
Shortleaf pine	167.7	26
Virginia pine	299.2	20
Eastern redcedar	428.1	15
Pitch pine	47.8	*
TOTAL LOBLOLLY AND SHORTLEAF PINE	942.8	10
Eastern redcedar/hardwood	470.5	16
Virginia pine/southern red oak	282.2	20
Shortleaf pine/oak	183.3	25
Other oak/pine	104.6	33
TOTAL OAK/PINE	1,040.6	10
Post, black, or bear oak	673.6	13
Chestnut oak	754.6	12
White oak/red oak/hickory	1,947.3	7
White oak	564.9	14
Northern red oak	49.9	*
Yellow-poplar/white oak/northern red oak	519.8	15
Sweetgum/yellow-poplar	918.8	11
Mixed hardwoods	2,059.6	8
TOTAL OAK/HICKORY	7,488.5	3
Swamp chestnut and cherrybark oak	25.8	*
Sweetbay/swamp tupelo/red maple	75.8	41
TOTAL OAK/GUM	101.6	34
Black ash/American elm/red maple	789.3	12
River birch/sycamore	113.1	32
Willow	33.6	*
TOTAL ELM/ASH/RED MAPLE	936.0	11
Sugar maple/beech/yellow birch	1,316.6	9
Black cherry	23.0	*
Black walnut	14.6	**
TOTAL MAPLE/BEECH/BIRCH	1,354.2	9
All types	11,901.9	0.5

* Sampling error of 50 to 99 percent.

** Sampling error of more than 99 percent.

Table 11.—Area of noncommercial forest land, by forest type group, Kentucky, 1975

(In thousands of acres)

Forest type group	All areas	Productive-reserved areas	Unproductive areas
Loblolly and shortleaf pine	12.8	12.8	—
Oak/pine	27.5	.6	26.9
Oak/hickory	192.5	175.8	16.7
Elm/ash/red maple	13.3	10.8	2.5
Maple/beech/birch	12.8	12.8	—
All types	258.9	212.8	46.1

Table 12.—Number of trees on commercial forest land by species group, tree class, and diameter class, Kentucky, 1975

(In thousands of trees)

Dbh class (inches)	Softwoods			Hardwoods		
	Growing-stock trees	Rough and rotten trees	Total	Growing-stock trees	Rough and rotten trees	Total
Poletimber						
5.0 to 6.9	60,317	9,318	69,635	408,879	117,006	525,885
7.0 to 8.9	36,255	3,567	39,822	245,099	39,287	284,386
9.0 to 10.9	—	—	—	169,082	19,115	188,197
Total	96,572	12,885	109,457	823,060	175,408	998,468
Small sawtimber						
9.0 to 10.9	22,382	2,769	25,151	—	—	—
11.0 to 12.9	11,459	1,028	12,487	100,351	11,609	111,960
13.0 to 14.9	4,252	270	4,522	65,600	5,625	71,225
Total	38,093	4,067	42,160	165,951	17,234	183,185
Large sawtimber						
15.0 to 16.9	1,950	284	2,234	40,050	3,947	43,997
17.0 to 18.9	544	121	665	21,816	3,077	24,893
19.0 to 20.9	278	—	278	10,788	1,967	12,755
21.0 to 28.9	192	20	212	12,312	3,584	15,896
29.0 and larger	17	—	17	1,341	864	2,205
Total	2,981	425	3,406	86,307	13,439	99,746
All classes	137,646	17,377	155,023	1,075,318	206,081	1,281,399

Table 13.—Number of growing-stock trees on commercial forest land, by species and diameter class, Kentucky, 1975
(In thousands of trees)

Species	Diameter class (inches at breast height)												
	All classes	5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+		
Redcedar	30,952	20,362	7,026	2,003	708	367	190	96	—	—	—	—	
Hard pines	100,357	38,267	27,845	18,780	10,076	3,512	1,453	305	78	41	—	—	
Other softwoods	6,337	1,488	1,384	1,599	675	373	307	143	200	151	17	—	
Total softwoods	137,646	60,317	36,255	22,382	11,459	4,252	1,950	544	278	192	17	—	
Select white oaks	143,974	50,879	31,386	24,016	15,732	9,502	6,740	3,226	964	1,463	66	—	
Select red oaks	44,175	11,803	9,159	6,650	4,881	3,697	3,181	1,714	1,192	1,808	90	—	
Other white oaks	97,117	29,484	22,115	17,633	10,707	7,404	4,411	2,468	1,302	1,291	302	—	
Other red oaks	142,204	42,448	31,445	23,317	15,450	12,090	8,311	4,469	2,164	2,258	252	—	
Red maple	56,938	30,542	12,760	5,794	2,851	2,370	1,246	533	445	303	94	—	
Sugar maple	50,899	21,130	13,110	7,496	3,776	2,342	1,656	784	262	342	1	—	
Hickory	179,445	76,884	40,373	30,296	14,026	9,432	4,172	2,384	943	882	53	—	
Beech	28,085	6,884	6,175	3,849	2,764	2,231	1,771	1,403	1,019	1,725	264	—	
Ash	43,313	15,428	12,028	7,444	4,021	2,132	1,158	536	270	278	18	—	
Black walnut	19,271	8,245	4,939	2,573	1,852	1,002	474	67	55	64	—	—	
Sweetgum	13,739	4,657	3,644	2,415	1,601	861	304	100	90	67	—	—	
Yellow-poplar	97,814	32,075	22,856	17,581	10,454	7,133	3,740	2,028	948	905	94	—	
Blackgum	22,591	8,430	5,321	3,013	2,697	1,560	695	550	200	125	—	—	
Basswood	11,837	6,154	1,886	1,253	1,184	486	405	250	146	73	—	—	
Other hardwoods	123,916	63,836	27,902	15,752	8,355	3,358	1,786	1,304	788	728	107	—	
Total hardwoods	1,075,318	408,879	245,099	169,082	100,351	65,600	40,050	21,816	10,788	12,312	1,341	—	
All species	1,212,964	469,196	281,354	191,464	111,810	69,852	42,000	22,360	11,066	12,504	1,358	—	

Table 14.—Net volume of timber on commercial forest land, by class of timber, softwoods, and hardwoods, Kentucky, 1975

(In millions of cubic feet)

Class of timber	All species		
	Softwoods	Hardwoods	
Sawtimber trees			
Sawlog portion	5,729.2	479.0	5,250.2
Upper-stem portion	1,283.8	70.2	1,213.6
All sawtimber trees	7,013.0	549.2	6,463.8
Poletimber trees	4,430.7	313.3	4,117.4
All growing-stock trees	11,443.7	862.5	10,581.2
Rough trees	742.7	96.5	646.2
Rotten trees	427.6	3.9	423.7
All trees	12,614.0	962.9	11,651.1

Table 15.—Net volume of growing stock and sawtimber on commercial forest land, by ownership class, stand-size class, softwoods, and hardwoods, Kentucky, 1975

Ownership or stand-size class	Growing stock (million cubic feet)			Sawtimber (million board feet) ^a		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
BY OWNERSHIP CLASS						
National forest	744.0	144.2	599.8	1,907.5	411.6	1,495.9
Other public	339.3	3.3	336.0	686.5	7.5	679.0
Forest industry	236.8	6.0	230.8	542.9	14.0	528.9
Farmer and other	10,123.6	709.0	9,414.6	24,415.0	1,533.9	22,881.1
All ownerships	11,443.7	862.5	10,581.2	27,551.9	1,967.0	25,584.9
BY STAND-SIZE CLASS						
Sawtimber stands	7,336.6	552.8	6,783.8	21,282.4	1,490.4	19,792.0
Poletimber stands	2,959.9	176.4	2,783.5	4,345.8	296.4	4,049.4
Sapling-seedling stands	1,145.3	133.3	1,012.0	1,920.3	180.2	1,740.1
Nonstocked areas	1.9	—	1.9	3.4	—	3.4
All classes	11,443.7	862.5	10,581.2	27,551.9	1,967.0	25,584.9

^aInternational 1/4-inch rule.

Table 16.—Net volume of growing stock and sawtimber on commercial forest land, by forest type group, and softwoods and hardwoods, Kentucky, 1975

Forest type group	Growing stock (million cubic feet)			Sawtimber (million board feet) ^a		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
White and red pine	52.9	28.4	24.5	127.6	98.7	28.9
Loblolly and shortleaf pine	570.3	386.2	184.1	1,098.5	777.0	321.5
Oak/pine	756.3	221.4	534.9	1,671.7	550.4	1,121.3
Oak/hickory	7,874.0	170.7	7,703.3	18,932.7	399.0	18,533.7
Oak/gum	114.8	—	114.8	317.4	—	317.4
Elm/ash/red maple	695.6	29.7	665.9	1,554.3	78.7	1,475.6
Maple/beech/birch	1,379.8	26.1	1,353.7	3,849.7	63.2	3,786.5
All types	11,443.7	862.5	10,581.2	27,551.9	1,967.0	25,584.9

^aInternational 1/4-inch rule.

Table 17.—Net volume of growing stock on commercial forest land, by species and diameter class, Kentucky, 1975

(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	116.1	51.7	31.2	13.8	7.2	5.6	4.0	2.6	—	—	—
Hard pines	661.2	82.9	133.6	169.3	145.0	73.4	41.4	12.0	3.6	—	—
Other softwoods	85.2	5.6	8.3	17.1	9.5	7.8	8.5	5.4	8.6	12.8	1.6
Total softwoods	862.5	140.2	173.1	200.2	161.7	86.8	53.9	20.0	12.2	12.8	1.6
Select white oaks	1,519.0	142.3	172.1	234.5	248.1	221.2	217.0	130.9	50.6	96.4	5.9
Select red oaks	652.5	35.5	51.7	63.6	74.2	82.0	97.4	62.6	56.3	118.2	11.0
Other white oaks	1,081.3	91.4	119.8	166.6	165.5	162.8	126.4	90.6	58.1	68.8	31.3
Other red oaks	1,744.6	129.7	178.5	224.9	236.3	272.7	250.9	174.7	102.9	145.1	28.9
Red maple	409.8	90.5	68.8	53.7	39.9	48.2	36.3	21.2	20.1	19.0	12.1
Sugar maple	441.4	73.9	77.2	71.0	58.1	48.3	49.7	32.3	11.8	19.1	—
Hickory	1,496.0	214.9	217.2	292.9	221.0	209.9	134.8	97.0	45.9	56.5	5.9
Beech	486.2	21.8	32.8	38.0	43.8	51.0	54.4	54.6	49.1	113.3	27.4
Ash	335.9	43.6	55.9	63.0	54.8	41.4	32.3	18.9	9.8	14.7	1.5
Black walnut	124.9	17.8	21.8	21.3	25.5	19.2	12.1	2.2	1.9	3.1	—
Sweetgum	130.0	14.8	20.0	25.6	27.5	18.3	10.4	3.9	4.6	4.9	—
Yellow-poplar	1,007.9	103.8	129.6	169.1	155.2	147.4	109.4	77.1	47.8	58.9	9.6
Blackgum	221.1	25.3	31.0	29.9	41.9	33.5	21.6	21.1	9.3	7.5	—
Basswood	107.4	17.1	11.3	14.8	18.1	11.4	12.1	9.4	7.3	5.9	—
Other hardwoods	823.2	163.4	138.5	136.5	118.2	72.5	53.1	46.3	36.7	44.7	13.3
Total hardwoods	10,581.2	1,185.8	1,326.2	1,605.4	1,528.1	1,439.8	1,217.9	842.8	512.2	776.1	146.9
All species	11,443.7	1,326.0	1,499.3	1,805.6	1,689.8	1,526.6	1,217.8	862.8	524.4	788.9	148.5

Table 18.—Net volume of sawtimber on commercial forest land, by species and diameter class, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)								
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	
Redcedar	116.2	46.0	25.2	18.6	16.6	9.8	—	—	—	
Hard pines	1,577.9	543.9	529.8	276.6	162.6	49.7	15.3	—	—	
Other softwoods	272.9	57.6	33.0	29.6	33.3	22.0	35.3	56.0	6.1	
Total softwoods	1,967.0	647.5	588.0	324.8	212.5	81.5	50.6	56.0	6.1	
Select white oaks	3,807.0	—	839.4	831.4	876.0	557.9	220.7	452.3	29.3	
Select red oaks	2,055.4	—	249.3	307.1	387.8	262.6	245.0	551.2	52.4	
Other white oaks	2,775.4	—	550.2	605.0	505.2	379.2	251.5	340.2	144.1	
Other red oaks	4,832.2	—	793.0	1,021.7	999.4	737.8	451.2	689.5	139.6	
Red maple	768.5	—	132.5	179.5	143.0	85.1	85.9	86.8	55.7	
Sugar maple	848.6	—	192.1	184.5	198.0	134.1	51.3	88.3	.3	
Hickory	2,991.3	—	741.9	791.8	541.4	411.4	202.1	274.7	28.0	
Beech	1,677.9	—	146.1	190.3	217.8	229.1	217.5	545.3	131.8	
Ash	660.6	—	182.0	154.6	127.9	78.6	42.9	67.3	7.3	
Black walnut	237.7	—	84.9	72.9	48.1	9.4	8.5	13.9	—	
Sweetgum	265.0	—	91.5	70.3	43.1	16.8	21.2	22.1	—	
Yellow-poplar	2,389.9	—	526.8	558.2	441.8	328.4	206.5	283.0	45.2	
Blackgum	515.9	—	139.3	123.7	86.1	90.6	41.2	35.0	—	
Basswood	254.8	—	62.1	42.5	49.2	40.7	32.4	27.8	—	
Other hardwoods	1,504.8	—	393.9	270.5	213.1	196.1	161.7	205.5	64.0	
Total hardwoods	25,584.9	—	5,125.0	5,404.0	4,877.9	3,557.8	2,239.6	3,682.9	697.7	
All species	27,551.9	647.5	5,713.0	5,728.8	5,090.4	3,639.3	2,290.2	3,738.9	703.8	

^a International 1/4-inch rule.

Table 19.—Net volume of sawtimber on commercial forest land, by species and quality class, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	1,577.9	93.5	177.0	1,307.4	—
Other softwoods ^c	389.1	—	—	—	—
Total softwoods	1,967.0	93.5	177.0	1,307.4	—
Hardwoods					
Select white oaks	3,807.0	404.0	735.0	2,040.5	627.5
Select red oaks	2,055.4	375.9	523.4	859.7	296.4
Other white oaks	2,775.4	327.4	446.4	1,430.9	570.5
Other red oaks	4,832.2	663.2	838.3	2,401.4	929.3
Red maple	768.5	59.8	142.0	366.4	200.3
Sugar maple	848.6	97.5	135.6	407.3	208.2
Hickory	2,991.3	321.3	540.6	1,600.3	529.1
Beech	1,677.9	26.3	102.9	928.2	620.5
Ash	660.6	80.7	169.0	258.2	152.7
Black walnut	237.7	24.0	52.2	139.9	21.6
Sweetgum	265.0	27.9	45.3	157.9	33.9
Yellow-poplar	2,389.9	351.5	401.6	945.6	691.2
Blackgum	515.9	70.3	100.1	284.8	60.7
Basswood	254.7	28.2	33.9	172.2	20.4
Other hardwoods	1,504.8	149.5	271.6	813.8	269.9
Total hardwoods	25,584.9	3,007.5	4,538.1	12,807.1	5,232.2
Hardwood quality (%)	100	12	18	50	20

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard lumber grades.

Table 20.—Components of average annual change of growing stock and sawtimber on commercial forest land, softwoods and hardwoods, Kentucky, 1962-74

Components	All species	Softwoods	Hardwoods
GROWING STOCK			
<i>Thousand cubic feet</i>			
Gross growth ^a	410,243	37,968	372,275
Cull increment	- 30,536	- 1,879	- 28,657
Annual mortality	- 60,357	- 3,548	- 56,809
Average annual:			
Net growth	319,350	32,541	286,809
Removals	- 138,575	- 11,750	- 127,825
Inventory change	179,775	20,791	158,984
SAWTIMBER			
<i>Thousand board feet^b</i>			
Gross growth ^a	1,123,794	80,330	1,043,464
Cull increment	- 91,881	- 3,231	- 88,650
Annual mortality	- 137,496	- 3,876	- 133,620
Average annual:			
Net growth	894,417	73,223	821,194
Removals	- 452,918	- 27,057	- 425,861
Inventory change	441,499	46,166	395,333

^a Includes growth on trees that were cut.

^b International ¼-inch rule.

Table 21.—Annual net growth, removals, and mortality of growing stock and sawtimber on commercial forest land, by species, Kentucky, 1974

Species	Growing stock			Sawtimber		
	Annual net growth	Annual timber removals ^a	Annual mortality	Annual net growth	Annual timber removals ^a	Annual mortality
	<i>Thousand cubic feet</i>			<i>Thousand board feet^b</i>		
Softwoods						
Hard pines	30,296	11,072	3,136	66,248	28,671	6,799
Other softwoods	7,504	528	964	11,752	1,329	2,201
Total softwoods	37,800	11,600	4,100	78,000	30,000	9,000
Hardwoods						
Select white oaks	62,658	32,163	2,060	163,128	101,475	2,444
Select red oaks	27,439	5,163	2,624	84,961	19,300	5,839
Other white oaks	32,566	3,777	2,058	86,291	11,194	3,809
Other red oaks	43,316	38,534	7,902	146,359	139,653	13,301
Maples	29,385	4,065	1,425	63,197	11,493	1,749
Hickory	41,442	10,588	5,143	78,815	30,258	6,699
Beech	12,800	2,416	2,647	56,478	10,313	10,943
Yellow-poplar	46,004	21,601	1,130	80,374	64,715	876
Other hardwoods	57,990	18,993	11,611	115,397	44,599	13,340
Total hardwoods	353,600	137,300	36,600	875,000	433,000	59,000
All species	391,400	148,900	40,700	953,000	463,000	68,000

^a Data for timber removals in this table are based on the trend from 1962 through 1974 and differ from those shown in Table 27. Table 27 reports results of a canvass of timber removals for 1974.

^b International ¼-inch rule.

Table 22.—Annual net growth and removals of growing stock and sawtimber on commercial forest land, by ownership class, and softwoods and hardwood, Kentucky, 1974

Ownership class	Annual net growth			Annual timber removals ^a		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	GROWING STOCK					
	<i>Thousand cubic feet</i>					
National forest	26,363	6,319	20,044	8,121	3,851	4,270
Other public	11,373	145	11,228	2,894	24	2,870
Forest industry	7,976	263	7,713	576	—	576
Farmer and other	345,688	31,073	314,615	137,309	7,725	129,584
All ownerships	391,400	37,800	353,600	148,900	11,600	137,300
	SAWTIMBER					
	<i>Thousand board feet^b</i>					
National forest	67,481	16,321	51,160	30,507	13,793	16,714
Other public	23,520	298	23,222	11,389	88	11,301
Forest industry	18,643	555	18,088	2,382	—	2,382
Farmer and other	843,356	60,826	782,530	418,722	16,119	402,603
All ownerships	953,000	78,000	875,000	463,000	30,000	433,000

^a Data for timber removals in this table are based on the trend from 1962 through 1974 and differ from those shown in Table 27. Table 27 reports results of a canvass of timber removals for 1974.

^b International ¼-inch rule.

Table 23.—Annual mortality of growing stock and sawtimber on commercial forest land, by ownership class, cause, and softwoods and hardwoods, Kentucky, 1974

Ownership class and cause	Growing stock (thousand cubic feet)			Sawtimber (thousand board feet) ^a		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	BY OWNERSHIP CLASS					
National forest	2,760	685	2,075	5,332	1,883	3,449
Other public	1,177	15	1,162	1,600	34	1,566
Forest industry	827	29	798	1,283	63	1,220
Farmer and other	35,936	3,371	32,565	59,785	7,020	52,765
All ownerships	40,700	4,100	36,600	68,000	9,000	59,000
	BY CAUSE					
Fire	734	—	734	603	—	603
Insects	58	—	58	—	—	—
Disease	5,868	479	5,389	8,613	2,219	6,394
Other	4,385	1,041	3,344	9,557	3,588	5,969
Unknown	29,655	2,580	27,075	49,227	3,193	46,034
All causes	40,700	4,100	36,600	68,000	9,000	59,000

^a International ¼-inch rule.

Table 24.—Sampling errors for major forest-area and timber-volume classes, Kentucky 1975

Table no.	Item classification	Sampling error	Table no.	Item classification	Sampling error
	<i>Percent</i>				<i>Percent</i>
	FOREST AREA				
1	Forest-land area		6	Area-condition class	
	Commercial	0.5		10 to 50	4
	Unproductive	50.3		60	3
	Total	0.6		70	10
2	Ownership class ^a		7	Growth-per-acre class (cubic feet)	
	Forest industry	26		120 to 165	11
	Farmer-owned	4		85 to 120	5
	Misc. private-individual	4		50 to 85	4
	Misc. private-corporate	12		Less than 50	6
3	Stand-size class			NUMBER OF TREES	
	Sawtimber	3			
	Poletimber	5			
	Sapling-seedling	5			
	Nonstocked areas	*			
4	Stand-volume per acre (board feet)				
	Less than 1,500	4			
	1,500 to 5,000	3			
	More than 5,000	7			
5	Stocking class (in percent)		12	Growing-stock trees (dbh class)	
		<i>Percent</i>		5.0 to 6.9	9 3
		<i>All trees</i>		7.0 to 8.9	11 3
		<i>Growing stock</i>		9.0 to 10.9	— 3
	160	*		Poletimber	7 2
	150 to 159	27		9.0 to 10.9	11 —
	140 to 149	14		11.0 to 12.9	11 4
	130 to 139	7		13.0 to 14.9	15 4
	Overstocked	6		Small sawtimber	8 3
	120 to 129	6		15.0 to 16.9	16 5
	110 to 119	6		17.0 to 18.9	23 5
	100 to 109	8		19.0 to 20.9	32 6
	Fully stocked	4		21.0 to 28.9	33 5
	90 to 99	10		29.0 and larger	* 12
	80 to 89	18		Large sawtimber	12 3
	70 to 79	21		All classes	6 2
	60 to 69	38			
	Medium stocked	8	13	Species	<i>Percent</i>
	50 to 59	45		Redcedar	13
	40 to 49	46		Hard pines	10
	30 to 39	45		Other softwoods	23
	20 to 29	*		Select white oaks	5
	10 to 19	*		Select red oaks	8
	0 to 9	—		Other white oaks	7
	Poorly stocked	25		Other red oaks	5
				Red maple	8

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Table 25.—Output of timber products, by source of material, softwoods and hardwoods, Kentucky, 1974

Product and species group	Standard units	Total output		Output from roundwood		Output from plant byproducts	
		Number of units	Thousand cubic feet	Number of units	Thousand cubic feet	Number of units	Thousand cubic feet
Sawlogs							
Softwood	M bd. ft. ^a	32,292	5,771	32,292	5,771	—	—
Hardwood	M bd. ft. ^a	456,502	66,658	456,502	66,658	—	—
Total	M bd. ft. ^a	488,794	72,429	488,794	72,429	—	—
Veneer logs and bolts							
Softwood	M bd. ft. ^a	—	—	—	—	—	—
Hardwood	M bd. ft. ^a	6,332	853	6,332	853	—	—
Total	M bd. ft. ^a	6,332	853	6,332	853	—	—
Pulpwood							
Softwood	Std. cords ^b	33,700	2,865	24,800	2,108	8,900	712
Hardwood	Std. cords ^b	362,700	30,829	108,300	9,205	254,400	20,352
Total	Std. cords ^b	396,400	33,694	133,100	11,313	263,300	21,064
Cooperage logs and bolts							
Softwood	M bd. ft. ^a	—	—	—	—	—	—
Hardwood	M bd. ft. ^a	12,159	1,733	12,159	1,733	—	—
Total	M bd. ft. ^a	12,159	1,733	12,159	1,733	—	—
Poles							
Softwood	M pieces	6	60	6	60	—	—
Hardwood	M pieces	—	—	—	—	—	—
Total	M pieces	6	60	6	60	—	—
Posts (round and split)							
Softwood	M pieces	734	1,577	734	1,577	—	—
Hardwood	M pieces	10	21	10	21	—	—
Total	M pieces	744	1,598	744	1,598	—	—
Mine timbers (round)							
Softwood	M cu. ft.	428	428	428	428	—	—
Hardwood	M cu. ft.	4,823	4,823	4,823	4,823	—	—
Total	M cu. ft.	5,251	5,251	5,251	5,251	—	—
Other^c							
Softwood	M cu. ft.	3,386	3,386	1,718	1,718	1,668	1,668
Hardwood	M cu. ft.	6,096	6,096	3,112	3,112	2,984	2,984
Total	M cu. ft.	9,482	9,482	4,830	4,830	4,652	4,652
Total industrial products							
Softwood	M cu. ft.		14,042		11,662		2,380
Hardwood	M cu. ft.		109,741		86,405		23,336
Total	M cu. ft.		123,783		98,067		25,716
Fuelwood							
Softwood	Std. cords	4,487	359	—	—	4,487	359
Hardwood	Std. cords	138,475	11,078	116,275	9,302	22,200	1,776
Total	Std. cords	142,962	11,437	116,275	9,302	26,687	2,135
All products^d							
Softwood	M cu. ft.		14,401		11,662		2,739
Hardwood	M cu. ft.		120,819		95,707		25,112
Total	M cu. ft.		135,220		107,369		27,851

^a International ¼-inch rule.

^b Rough wood basis, includes chips converted to equivalent standard cords.

^c Includes charcoal, flakeboard, handle stock, dimension, and metallurgical chips.

^d Does not include 136,000 cubic feet of softwood and 1,053,000 cubic feet of hardwood residues used for agricultural bedding.

Table 26.—Output of roundwood products, by source, softwoods and hardwoods, Kentucky, 1974
(In thousands of cubic feet)

Product and species group	All sources	Growing-stock trees ^a			Rough and rotten trees ^a	Salvable dead trees ^a	Other sources ^b
		Total	Sawtimber	Poletimber			
PRINCIPAL INDUSTRIAL PRODUCTS							
Sawlogs							
Softwood	5,771	4,543	4,518	25	—	882	346
Hardwood	66,658	63,110	63,019	91	—	680	2,868
Total	72,429	67,653	67,537	116	—	1,562	3,214
Veneer logs and bolts							
Softwood	—	—	—	—	—	—	—
Hardwood	853	853	853	—	—	—	—
Total	853	853	853	—	—	—	—
Pulpwood							
Softwood	2,108	1,583	872	711	—	21	504
Hardwood	9,205	7,537	5,438	2,099	792	—	876
Total	11,313	9,120	6,310	2,810	792	21	1,380
MISCELLANEOUS INDUSTRIAL PRODUCTS							
Cooperage logs and bolts							
Softwood	—	—	—	—	—	—	—
Hardwood	1,733	1,733	1,733	—	—	—	—
Total	1,733	1,733	1,733	—	—	—	—
Poles							
Softwood	60	60	—	60	—	—	—
Hardwood	—	—	—	—	—	—	—
Total	60	60	—	60	—	—	—
Posts (round and split)							
Softwood	1,577	1,519	142	1,377	28	—	30
Hardwood	21	20	2	18	(^c)	—	1
Total	1,598	1,539	144	1,395	28	—	31
Mine timbers (round)							
Softwood	428	412	164	248	—	—	16
Hardwood	4,823	4,645	1,851	2,794	—	—	178
Total	5,251	5,057	2,015	3,042	—	—	194
Other							
Softwood	1,718	967	385	582	13	64	674
Hardwood	3,112	2,119	1,214	905	132	75	786
Total	4,830	3,086	1,599	1,487	145	139	1,460
TOTAL INDUSTRIAL PRODUCTS							
Softwood	11,662	9,084	6,081	3,003	41	967	1,570
Hardwood	86,405	80,017	74,110	5,907	924	755	4,709
Total	98,067	89,101	80,191	8,910	965	1,722	6,279
NONINDUSTRIAL PRODUCTS							
Fuelwood							
Softwood	—	—	—	—	—	—	—
Hardwood	9,302	5,234	2,082	3,152	70	347	3,651
Total	9,302	5,234	2,082	3,152	70	347	3,651
ALL PRODUCTS							
Softwood	11,662	9,084	6,081	3,003	41	967	1,570
Hardwood	95,707	85,251	76,192	9,059	994	1,102	8,360
Total	107,369	94,335	82,273	12,062	1,035	2,069	9,930

^a On commercial forest land.

^b Includes trees less than 5.0 inches in diameter, tree tops and limbs from commercial forest areas, or any material from noncommercial forest land or nonforest land such as fence rows and suburban areas.

^c Negligible amount.

Table 27.—Timber removals from growing stock and sawtimber on commercial forest land, by items, softwoods and hardwoods, Kentucky, 1974

Item	Growing stock			Sawtimber		
	All species	Softwoods	Hardwoods	All species	Softwoods	Hardwoods
	<i>Thousand cubic feet</i>			<i>Thousand board feet^a</i>		
Roundwood products						
Sawlogs	67,653	4,543	63,110	360,434	20,263	340,171
Veneer logs and bolts	853	—	853	6,332	—	6,332
Pulpwood	9,120	1,583	7,537	23,390	2,838	20,552
Cooperage logs and bolts	1,733	—	1,733	12,159	—	12,159
Poles	60	60	—	—	—	—
Posts	1,539	1,519	20	592	584	8
Mine timbers	5,057	412	4,645	10,728	736	9,992
Other	3,086	967	2,119	8,962	1,727	7,235
Fuelwood	5,234	—	5,234	11,238	—	11,238
All products	94,335	9,084	85,251	433,835	26,148	407,687
Logging residues	25,930	1,163	24,767	37,748	1,361	36,387
Other removals	29,353	2,723	26,630	57,264	2,204	55,060
Total removals	149,618	12,970	136,648	528,847	29,713	499,134

^a International 1/4-inch rule.

Table 28.—Volume of unused residues at primary manufacturing plants, by industry and type of residue, and softwoods and hardwoods, Kentucky, 1974
(In thousands of cubic feet)

Species group and type of residues	All industries	Lumber	Veneer and plywood	Other
Softwoods				
Coarse ^a	157	157	—	—
Fine ^b	330	330	—	—
Total	487	487	—	—
Hardwoods				
Coarse ^a	1,911	1,152	57	702
Fine ^b	8,279	7,913	135	231
Total	10,190	9,065	192	933
All species				
Coarse ^a	2,068	1,309	57	702
Fine ^b	8,609	8,243	135	231
Total	10,677	9,552	192	933

^a Material, such as slabs, edgings, and veneer cores.

^b Material, such as sawdust and shavings.

Table 29.—Projection of annual net growth, timber removals, and inventory of growing stock and sawtimber on commercial forest land in Kentucky, 1974-2004^a

Species group	1974 (inventory year)	1984	1994	2004
GROWING STOCK <i>Million cubic feet</i>				
Softwoods				
Removals	11.6	18.0	19.3	20.7
Growth	37.8	44.4	53.3	63.9
Inventory	862.5	1,081.3	1,356.2	1,699.5
Hardwoods				
Removal	137.3	142.0	150.7	159.3
Growth	353.6	415.5	498.9	597.3
Inventory	10,581.2	13,259.5	16,629.9	20,840.8
Total				
Removals	148.9	160.0	170.0	180.0
Growth	391.4	459.9	552.2	661.2
Inventory	11,443.7	14,340.8	17,986.1	22,540.3
SAWTIMBER <i>Million board feet^b</i>				
Softwoods				
Removals	30.0	32.5	34.9	37.4
Growth	78.0	90.4	106.9	126.3
Inventory	1,967.0	2,424.7	2,994.9	3,701.2
Hardwoods				
Removals	433.0	468.3	503.8	539.1
Growth	875.0	1,013.4	1,198.7	1,416.2
Inventory	25,584.9	31,539.0	38,954.3	48,142.0
Total				
Removals	463.0	500.8	538.7	576.5
Growth	953.0	1,103.8	1,305.6	1,542.5
Inventory	27,551.9	33,963.7	41,949.2	51,843.2

^a Based upon the following assumptions: The area of commercial forest land will not change significantly. There will be no significant increase in the level of forest management. All forest industries except pulpwood and a yet undeveloped fiber or particle board industry will show little significant growth.

^b International 1/4-inch rule.

Table 30.—Projection of annual net growth, timber removals, and inventory of growing stock and sawtimber on commercial forest land in Kentucky, 1974-2004^a

Species group	1974 (inventory year)	1984	1994	2004
GROWING STOCK <i>Million cubic feet</i>				
Softwoods				
Removals	11.6	21.4	32.7	43.2
Growth	37.8	43.0	46.3	46.2
Inventory	862.5	1,039.1	1,160.6	1,201.4
Hardwoods				
Removals	137.3	236.6	335.3	434.8
Growth	353.6	402.2	433.4	431.8
Inventory	10,581.2	12,742.6	14,231.7	14,732.5
Total				
Removals	148.9	258.0	368.0	478.0
Growth	391.4	445.2	479.7	478.0
Inventory	11,443.7	13,781.7	15,392.3	15,933.9
SAWTIMBER <i>Million board feet^b</i>				
Softwoods				
Removals	30.0	50.2	72.7	93.0
Growth	78.0	87.7	93.6	93.1
Inventory	1,967.0	2,336.6	2,588.2	2,671.9
Hardwoods				
Removals	433.0	634.8	837.3	1,044.3
Growth	875.0	983.4	1,050.7	1,044.2
Inventory	25,584.9	30,392.2	33,644.4	34,753.3
Total				
Removals	463.0	685.0	910.0	1,137.3
Growth	953.0	1,071.1	1,144.3	1,137.3
Inventory	27,551.9	32,728.8	36,252.6	37,425.2

^a Based upon the following assumptions: The area of commercial forest land will not change significantly. The level of forest management will be improved sufficiently to bring total growing-stock growth and removals into balance by 2004.

^b International ¼-inch rule.

Table 31.—Land area of Kentucky, by land class and geographic unit, 1975
(In thousands of acres)

Geographic unit	Commercial forest land	Unproductive forest land	Productive-reserved forest land	Total forest land	Nonforest land	All land
Western	704.1	2.5	4.4	711.0	1,479.8	2,190.8
Western Coalfield	1,845.4	3.4	50.5	1,899.3	3,579.2	5,478.5
Pennyroyal	2,129.1	12.7	68.9	2,210.7	2,570.0	4,780.7
Bluegrass	1,330.1	—	7.4	1,337.5	4,304.3	5,641.8
Northern Cumberland	1,848.4	—	40.8	1,889.2	606.7	2,495.9
Southern Cumberland	2,156.7	.6	24.8	2,182.1	600.5	2,782.6
Eastern	1,888.1	26.9	16.0	1,931.0	203.5	2,134.5
All units	11,901.9	46.1	212.8	12,160.8	13,344.0	25,504.8

Table 32.—Area of commercial forest land in Kentucky, by ownership class and geographic unit, 1975
(In thousands of acres)

Ownership class	Western	Western Coalfield	Pennyroyal	Bluegrass	Northern Cumberland	Southern Cumberland	Eastern	Total
National Forest	—	—	27.0	16.2	103.5	394.5	47.6	588.8
Other Federal	125.6	5.1	72.6	1.8	—	.2	24.6	229.9
State	6.9	21.2	4.1	3.1	.8	24.5	15.4	76.0
County and municipal	.3	.1	.1	.1	—	—	—	.6
Total public	132.8	26.4	103.8	21.2	104.3	419.2	87.6	895.3
Forest industry	47.3	20.2	26.4	—	81.6	26.6	53.0	255.1
Farmer-owned	368.5	1,157.2	1,228.3	905.6	880.4	682.2	266.8	5,489.0
Miscellaneous private:								
Individual	155.5	422.4	746.4	372.1	725.8	958.5	1,051.1	4,431.8
Corporate	—	219.2	24.2	31.2	56.3	70.2	429.6	830.7
Total miscellaneous private	155.5	641.6	770.6	403.3	782.1	1,028.7	1,480.7	5,262.5
All ownerships	704.1	1,845.4	2,129.1	1,330.1	1,848.4	2,156.7	1,888.1	11,901.9

Table 33.—Area of commercial forest land in Kentucky, by stand-size class and geographic unit, 1975
(In thousands of acres)

Geographic unit	Sawtimber stands	Poletimber stands	Other stands	All classes
Western	278.8	196.3	229.0	704.1
Western Coalfield	757.4	465.1	622.9	1,845.4
Pennyroyal	1,097.6	547.8	483.7	2,129.1
Bluegrass	381.5	308.6	640.0	1,330.1
Northern Cumberland	794.4	550.0	504.0	1,848.4
Southern Cumberland	1,153.4	555.0	448.3	2,156.7
Eastern	1,081.2	383.3	423.6	1,888.1
Total	5,544.3	3,006.1	3,351.5	11,901.9

Table 34.—Area of commercial forest land in Kentucky, by stand-volume class and geographic unit, 1975
(In thousands of acres)

Geographic unit	Standard-volume per acre (board feet) ^a			All classes
	Less than 1,500	1,500–5,000	More than 5,000	
Western	283.3	318.5	102.3	704.1
Western Coalfield	622.4	860.7	362.3	1,845.4
Pennyroyal	608.7	1,095.9	424.5	2,129.1
Bluegrass	904.3	396.4	29.4	1,330.1
Northern Cumberland	660.1	833.5	354.8	1,848.4
Southern Cumberland	715.9	1,216.1	224.7	2,156.7
Eastern	596.4	881.4	410.3	1,888.1
Total	4,391.1	5,602.5	1,908.3	11,901.9

^a International ¼-inch rule.

Table 35.—Area of commercial forest land in Kentucky, by stocking-percent class and geographic unit, 1975

(In thousands of acres)

Geographic unit	Stocking class (growing-stock trees)				All classes
	Over-stocked	Fully stocked	Medium stocked	Poorly stocked	
Western	33.9	304.8	297.8	67.6	704.1
Western Coalfield	74.8	828.7	872.6	69.3	1,845.4
Pennyroyal	62.2	760.4	1,207.3	99.2	2,129.1
Bluegrass	29.7	338.3	712.1	250.0	1,330.1
Northern Cumberland	94.9	836.6	821.7	95.2	1,848.4
Southern Cumberland	117.4	908.6	953.4	177.3	2,156.7
Eastern	13.5	584.2	1,049.1	241.3	1,888.1
Total	426.4	4,561.6	5,914.0	999.9	11,901.9

Table 36.—Area of commercial forest land in Kentucky, by area-condition class and geographic unit, 1975

(In thousands of acres)

Geographic units	Area-condition class			All classes
	Classes 10-50	Class 60	Class 70	
Western	311.9	317.8	74.4	704.1
Western Coalfield	840.5	935.5	69.4	1,845.4
Pennyroyal	572.8	1,432.2	124.1	2,129.1
Bluegrass	265.3	770.3	294.5	1,330.1
Northern Cumberland	883.5	869.6	95.3	1,848.4
Southern Cumberland	930.2	1,037.3	189.2	2,156.7
Eastern	516.7	1,103.0	268.4	1,888.1
Total	4,320.9	6,465.7	1,115.3	11,901.9

Table 37.—Area of commercial forest land in Kentucky, by potential site productivity class and geographic unit, 1975

(In thousands of acres)

Geographic unit	Growth-per-acre class (cubic feet)				All classes
	120 to 165	85 to 120	50 to 85	Less than 50	
Western	40.9	95.2	291.4	276.6	704.1
Western Coalfield	138.3	476.8	687.8	542.5	1,845.4
Pennyroyal	151.5	585.9	783.0	608.7	2,129.1
Bluegrass	117.6	221.0	563.5	428.0	1,330.1
Northern Cumberland	71.9	356.8	1,001.7	418.0	1,848.4
Southern Cumberland	189.2	63.6	983.1	351.8	2,156.7
Eastern	213.3	675.4	635.1	364.3	1,888.1
Total	922.7	3,043.7	4,945.6	2,989.9	11,901.9

Table 38.—Area of commercial forest land in Kentucky, by forest type group and geographic unit, 1975
(In thousands of acres)

Geographic unit	White and red pine	Loblolly/shortleaf pine	Oak/pine	Oak/hickory	Oak/gum	Elm/ash/red maple	Maple/beech/birch	All groups
Western	—	13.6	26.8	481.2	13.6	148.7	20.2	704.1
Western Coalfield	—	74.9	88.4	1,357.3	24.9	201.0	98.9	1,845.4
Pennyroyal	—	236.1	161.4	1,232.0	49.7	125.2	324.7	2,129.1
Buegrass	—	207.3	250.5	677.1	—	121.7	73.5	1,330.1
Northern Cumberland	12.0	119.4	157.9	1,286.3	—	142.9	129.9	1,848.4
Southern Cumberland	11.9	261.9	299.0	1,239.1	—	107.5	237.3	2,156.7
Eastern	14.3	29.6	56.6	1,215.5	13.4	89.0	469.7	1,888.1
Total	38.2	942.8	1,040.6	7,488.5	101.6	936.0	1,354.2	11,901.9

Table 39.—Number of growing-stock trees and rough and rotten trees on commercial forest land in Kentucky by diameter-class groups, softwoods and hardwoods, and geographic unit, 1975
(In thousands of trees)

Diameter-class group (in inches)	Western	Western Coalfield	Pennyroyal	Bluegrass	Northern Cumberland	Southern Cumberland	Eastern	Total
GROWING-STOCK TREES								
Softwoods								
5.0-8.9	1,512	4,488	18,513	13,410	20,824	30,898	6,927	96,572
9.0-18.9	400	1,545	3,953	2,951	9,453	18,706	3,579	40,587
19.0 and larger	—	65	23	—	77	192	130	487
Total	1,912	6,098	22,489	16,361	30,354	49,796	10,636	137,646
Hardwoods								
5.0-10.9	56,418	133,937	140,982	81,924	137,991	157,133	114,675	823,060
11.0-18.9	15,533	39,328	47,113	17,259	35,235	38,949	34,400	227,817
19.0 and larger	1,282	3,914	4,676	1,989	3,279	3,398	5,903	24,441
Total	73,233	177,179	192,771	101,172	176,505	199,480	154,978	1,075,318
All species	75,145	183,277	215,260	117,533	206,859	249,276	165,614	1,212,964
ROUGH AND ROTTEN TREES								
Softwoods								
5.0-8.9	572	1,838	3,459	4,358	511	1,224	923	12,885
9.0-18.9	107	344	2,019	808	—	789	405	4,472
19.0 and larger	—	—	20	—	—	—	—	20
Total	679	2,182	5,498	5,166	511	2,013	1,328	17,377
Hardwoods								
5.0-10.9	8,751	17,824	28,804	29,932	25,399	24,184	40,514	175,408
11.0-18.9	1,153	2,156	4,418	3,280	2,005	4,783	6,463	24,258
19.0 and larger	258	352	1,079	451	442	1,459	2,374	6,415
Total	10,162	20,332	34,301	33,663	27,846	30,426	49,351	206,081
All species	10,841	22,514	39,799	38,829	28,357	32,439	50,679	223,458

Table 40.—Number of growing-stock trees on commercial forest land, by species and diameter class, Western Unit, Kentucky, 1975

(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0-36.9
Redcedar	509	114	395	—	—	—	—	—	—	—	—
Hard pines	1,324	846	157	199	122	—	—	—	—	—	
Other softwoods	79	—	—	—	39	—	23	17	—	—	
Total softwoods	1,912	960	552	199	161	—	23	17	—	—	
Select white oaks	10,162	3,176	2,262	1,691	1,024	837	692	373	41	60	
Select red oaks	4,012	1,076	1,048	587	505	274	192	84	42	192	
Other white oaks	8,255	2,308	2,377	1,464	1,003	604	263	154	58	12	
Other red oaks	9,682	2,692	2,089	1,565	1,144	894	547	389	155	180	
Red maple	1,045	381	328	114	41	54	69	—	40	12	
Sugar maple	2,498	507	899	526	335	144	60	16	—	11	
Hickory	10,578	4,342	2,517	1,506	962	685	335	172	40	19	
Beech	523	141	—	240	—	50	24	18	14	22	
Ash	4,768	2,282	1,448	687	147	24	102	51	27	—	
Black walnut	613	262	190	65	36	60	—	—	—	—	
Sweetgum	2,320	1,176	193	263	259	165	191	16	41	16	
Yellow-poplar	501	277	—	51	33	87	21	17	15	—	
Blackgum	1,423	126	588	328	212	108	40	—	14	7	
Other hardwoods	16,853	9,986	2,839	1,821	1,177	312	365	166	52	106	
Total hardwoods	73,233	28,732	16,778	10,908	6,878	4,298	2,901	1,456	539	637	
All species	75,145	29,692	17,330	11,107	7,039	4,298	2,924	1,473	539	637	

Table 41.—Number of growing-stock trees on commercial forest land, by species and diameter class, Western Coalfield Unit, Kentucky, 1975

(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0-36.9
Redcedar	4,901	3,524	613	647	68	49	—	—	—	—	
Hard pines	1,005	—	183	448	266	—	67	—	—	41	
Other softwoods	192	—	168	—	—	—	—	—	24	—	
Total softwoods	6,098	3,524	964	1,095	334	49	67	—	24	41	
Select white oaks	19,669	4,016	4,428	4,298	2,729	2,066	1,119	498	201	314	
Select red oaks	7,965	2,091	1,511	1,230	982	529	842	168	175	428	
Other white oaks	13,029	4,080	3,258	2,218	1,675	1,081	395	214	44	45	
Other red oaks	19,345	7,173	3,402	2,664	2,361	1,582	936	421	223	488	
Red maple	7,931	3,340	1,361	1,280	626	591	307	224	71	96	
Sugar maple	9,995	3,650	2,513	1,695	707	520	489	273	70	78	
Hickory	32,514	14,037	5,294	6,555	3,114	1,603	1,022	560	135	183	
Beech	2,514	576	173	462	495	271	279	52	24	152	
Ash	13,387	6,863	2,919	1,597	973	471	351	117	47	49	
Black walnut	2,438	594	711	452	459	143	32	27	—	20	
Sweetgum	6,364	1,179	2,157	1,366	979	452	113	58	25	35	
Yellow-poplar	6,354	1,474	776	1,635	739	747	434	223	148	142	
Blackgum	5,543	2,062	958	1,428	497	326	151	85	—	36	
Other hardwoods	30,131	16,376	6,584	3,501	1,706	844	366	304	301	134	
Total hardwoods	177,179	67,511	36,045	30,381	18,042	11,226	6,836	3,224	1,464	2,200	
All species	183,277	71,035	37,009	31,476	18,376	11,275	6,903	3,224	1,488	2,241	

Table 42.—Number of growing-stock trees on commercial forest land, by species and diameter class, Pennyroyal Unit, Kentucky, 1975

(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	12,791	8,061	3,578	618	267	137	74	56	—	—	—
Hard pines	9,698	3,533	3,341	1,302	925	403	146	25	23	—	—
Total softwoods	22,489	11,594	6,919	1,920	1,192	540	220	81	23	—	—
Select white oaks	26,472	5,923	6,472	4,497	4,023	2,101	2,043	952	139	322	—
Select red oaks	8,421	1,502	2,294	1,160	1,328	627	548	416	299	238	9
Other white oaks	17,244	5,461	3,112	2,721	1,780	1,867	1,230	689	265	119	—
Other red oaks	24,641	7,390	4,767	4,722	2,713	1,859	1,372	817	492	477	32
Red maple	8,085	3,723	2,811	746	247	234	97	83	67	44	33
Sugar maple	19,140	9,826	4,719	1,994	915	670	559	335	70	52	—
Hickory	30,635	11,233	6,838	6,505	2,798	2,104	492	339	155	171	—
Beech	7,985	1,903	1,525	993	949	798	644	549	250	318	56
Ash	7,420	1,789	1,578	1,708	1,439	548	139	112	45	54	8
Black walnut	3,241	1,344	827	329	431	292	—	—	—	18	—
Sweetgum	2,939	1,523	652	263	255	196	—	26	24	—	—
Yellow-poplar	14,525	5,127	3,921	1,700	1,581	725	553	412	234	253	19
Blackgum	5,237	1,760	1,570	490	981	235	68	109	24	—	—
Basswood	268	—	—	88	122	—	36	—	22	—	—
Other hardwoods	16,518	6,156	4,294	3,026	1,319	687	415	254	130	197	40
Total hardwoods	192,771	64,660	45,380	30,942	20,881	12,943	8,196	5,093	2,216	2,263	197
All species	215,260	76,254	52,299	32,862	22,073	13,483	8,416	5,174	2,239	2,263	197

Table 43.—Number of growing-stock trees on commercial forest land, by species and diameter class, Bluegrass Unit, Kentucky, 1975

(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	11,685	8,070	2,326	738	245	181	85	40	—	—	—
Hard pines	4,676	1,440	1,574	1,090	334	186	52	—	—	—	—
Total softwoods	16,361	9,510	3,900	1,828	579	367	137	40	—	—	—
Select white oaks	12,760	6,187	2,209	1,605	1,271	608	412	184	59	199	26
Select red oaks	3,048	—	722	824	464	300	184	307	115	124	8
Other white oaks	4,580	1,215	1,574	910	450	—	179	150	56	46	—
Other red oaks	7,543	2,461	2,033	1,729	814	175	131	33	90	77	—
Red maple	3,083	1,938	474	126	183	184	50	—	90	24	14
Sugar maple	6,654	1,828	2,167	1,394	403	457	231	38	30	106	—
Hickory	17,413	6,689	3,975	3,436	1,318	1,109	335	332	150	69	—
Beech	55	—	—	—	—	—	—	36	—	19	—
Ash	9,842	1,763	4,090	1,836	842	562	320	179	151	89	10
Black walnut	7,673	3,946	1,797	901	411	285	235	40	32	26	—
Yellow-poplar	1,452	449	175	116	237	288	91	38	—	58	—
Blackgum	957	829	—	—	—	128	—	—	—	—	—
Basswood	809	325	—	—	164	122	95	76	27	—	—
Other hardwoods	25,303	12,112	6,281	3,808	1,846	315	240	407	145	137	12
Total hardwoods	101,172	39,742	25,497	16,685	8,403	4,533	2,503	1,820	945	974	70
All species	117,533	49,252	29,397	18,513	8,982	4,900	2,640	1,860	945	974	70

Table 44.—Number of growing-stock trees on commercial forest land, by species and diameter class, Northern Cumberland Unit, Kentucky, 1975
(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)										
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0	
Redcedar	434	320	114	—	—	—	—	—	—	—	—	—
Hard pines	27,999	12,406	7,194	5,197	1,938	873	340	51	—	—	—	—
Other softwoods	1,921	553	237	555	241	88	144	26	67	—	—	10
Total softwoods	30,354	13,279	7,545	5,752	2,179	961	484	77	67	—	—	10
Select white oaks	26,803	9,396	6,015	4,811	3,210	1,964	847	323	104	133	—	—
Select red oaks	6,494	2,333	887	1,016	325	708	540	211	172	302	—	—
Other white oaks	23,702	6,982	5,825	4,540	2,808	1,798	817	375	306	215	—	36
Other red oaks	32,680	9,624	8,188	4,872	3,610	2,859	1,905	788	466	326	—	42
Red maple	13,203	8,282	1,632	2,039	434	300	301	109	87	19	—	—
Sugar maple	2,305	1,236	424	273	197	40	98	—	21	16	—	—
Hickory	34,437	16,990	8,950	5,048	1,646	1,185	334	100	106	78	—	—
Beech	4,050	1,213	1,026	631	235	256	144	107	166	235	—	37
Ash	1,728	442	582	177	194	139	131	27	—	36	—	—
Black walnut	697	—	146	277	129	46	99	—	—	—	—	—
Sweetgum	308	—	—	152	108	48	—	—	—	—	—	—
Yellow-poplar	17,280	5,851	3,796	3,277	1,931	985	796	300	243	101	—	—
Blackgum	2,289	457	999	342	173	195	65	58	—	—	—	—
Basswood	644	205	—	260	52	85	—	29	—	13	—	—
Other hardwoods	9,885	4,895	2,732	1,168	600	313	130	28	—	19	—	—
Total hardwoods	176,505	67,906	41,202	28,883	15,652	10,921	6,207	2,455	1,671	1,493	—	115
All species	206,859	81,185	48,747	34,635	17,831	11,882	6,691	2,532	1,738	1,493	—	125

Table 45.—Number of growing-stock trees on commercial forest land, by species and diameter class, Southern Cumberland Unit, Kentucky, 1975
(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)										
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+	
Redcedar	632	473	—	—	128	—	31	—	—	—	—	—
Hard pines	46,349	16,404	12,442	9,068	5,751	1,845	669	129	41	—	—	—
Other softwoods	2,815	935	644	565	256	118	99	47	42	102	—	7
Total softwoods	49,796	17,812	13,086	9,633	6,135	1,963	799	176	83	102	—	7
Select white oak	34,212	15,030	7,599	5,800	2,654	1,166	934	624	194	194	—	17
Select red oaks	8,893	3,549	1,616	1,116	662	745	618	210	197	164	—	16
Other white oaks	18,374	6,609	3,435	3,835	1,802	1,139	870	307	147	221	—	9
Other red oaks	24,915	5,630	6,039	4,456	2,769	2,584	1,855	964	344	274	—	—
Red maple	13,050	7,135	3,625	839	533	664	200	—	41	13	—	—
Sugar maple	5,292	2,150	1,441	759	584	316	30	—	—	12	—	—
Hickory	32,507	15,585	7,414	4,707	2,140	1,241	699	380	165	176	—	—
Beech	4,997	1,661	1,190	467	335	323	269	180	196	306	—	70
Ash	3,241	1,627	671	430	260	163	37	24	—	29	—	—
Black walnut	1,982	198	1,100	247	238	176	—	—	23	—	—	—
Sweetgum	1,631	779	548	304	—	—	—	—	—	—	—	—
Yellow-poplar	28,941	9,206	6,989	5,104	3,157	2,542	939	672	166	138	—	28
Blackgum	4,347	2,542	478	174	462	245	161	155	68	62	—	—
Basswood	3,237	2,014	421	155	505	37	31	57	—	17	—	—
Other hardwoods	13,861	7,478	3,905	1,076	572	546	97	76	64	47	—	—
Total hardwoods	199,480	81,193	46,471	29,469	16,673	11,887	6,740	3,649	1,605	1,653	—	140
All species	249,276	99,005	59,557	39,102	22,808	13,850	7,539	3,825	1,688	1,755	—	147

Table 46.—Number of growing-stock trees on commercial forest land, by species and diameter class, Eastern Unit, Kentucky, 1975

(In thousands of trees)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Hard pines	9,306	3,638	2,954	1,476	740	205	179	100	14	—	—
Other softwoods	1,330	—	335	479	139	167	41	53	67	49	—
Total softwoods	10,636	3,638	3,289	1,955	879	372	220	153	81	49	—
Select white oaks	13,896	7,151	2,401	1,314	821	760	693	272	226	241	17
Select red oaks	5,342	1,252	1,081	717	615	514	257	318	192	360	36
Other white oaks	11,933	2,829	2,534	1,945	1,189	915	657	579	426	633	226
Other red oaks	23,398	7,478	4,927	3,309	2,039	2,137	1,565	1,057	394	436	56
Red maple	10,541	5,743	2,529	650	787	343	222	117	49	95	6
Sugar maple	5,015	1,933	947	855	635	195	189	122	71	67	1
Hickory	21,361	8,008	5,385	2,539	2,048	1,505	955	501	192	186	42
Beech	7,961	1,390	2,261	1,056	750	533	411	461	369	673	57
Ash	2,927	662	740	1,009	166	225	78	26	—	21	—
Black walnut	2,627	1,901	168	302	148	—	108	—	—	—	—
Sweetgum	177	—	94	67	—	—	—	—	—	16	—
Yellow-poplar	28,761	9,691	7,199	5,698	2,776	1,759	906	366	142	213	11
Blackgum	2,795	654	728	251	372	323	210	143	94	20	—
Basswood	6,879	3,610	1,465	750	341	242	243	88	97	43	—
Other hardwoods	11,365	6,833	1,267	1,352	1,135	341	173	69	96	88	11
Total hardwoods	154,978	59,135	33,726	21,814	13,822	9,792	6,667	4,119	2,348	3,092	463
All species	165,614	62,773	37,015	23,769	14,701	10,164	6,887	4,272	2,429	3,141	463

Table 47.—Net volume of timber on commercial forest land in Kentucky, by class of timber and geographic unit, 1975

(In millions of cubic feet)

Geographic unit	Growing-stock trees			Rough trees	Rotten trees	All trees
	Saw-timber	Pole-timber	Total			
Western	494.0	326.9	820.9	37.6	15.5	874.0
Western Coalfield	1,208.7	728.9	1,937.6	120.9	42.5	2,101.0
Pennyroyal	1,374.2	796.1	2,170.3	178.7	63.2	2,412.2
Bluegrass	315.8	265.3	581.1	83.4	21.4	685.9
Northern Cumberland	1,160.2	811.7	1,971.9	65.3	47.7	2,084.9
Southern Cumberland	1,214.8	886.8	2,101.6	147.2	96.9	2,345.7
Eastern	1,245.3	615.0	1,860.3	109.6	140.4	2,110.3
Total	7,013.0	4,430.7	11,443.7	742.7	427.6	12,614.0

Table 48.—Net volume of growing stock and sawtimber on commercial forest land in Kentucky, by ownership class and geographic unit, 1975

Geographic unit	Ownership classes				All classes
	National forest	Other public	Forest industry	Farmer and other	
	<i>Million cubic feet</i>				
Western	—	146.9	43.9	630.1	820.9
Western Coalfield	—	29.3	18.8	1,889.5	1,937.6
Pennyroyal	34.1	85.0	24.5	2,026.7	2,170.3
Bluegrass	20.5	5.6	—	555.0	581.1
Northern Cumberland	130.8	.9	75.7	1,764.5	1,971.9
Southern Cumberland	498.5	27.4	24.7	1,551.0	2,101.6
Eastern	60.1	44.2	49.2	1,706.8	1,860.3
Total	744.0	339.3	236.8	10,123.6	11,443.7
	<i>Million board feet^a</i>				
Western	—	297.4	100.6	1,577.6	1,975.6
Western Coalfield	—	59.1	43.1	4,551.1	4,653.3
Pennyroyal	87.5	172.1	56.1	5,097.5	5,413.2
Bluegrass	52.5	11.3	—	1,216.4	1,280.2
Northern Cumberland	335.5	1.8	173.6	3,721.6	4,232.5
Southern Cumberland	1,277.9	55.3	56.7	3,493.6	4,883.5
Eastern	154.1	89.5	112.8	4,757.2	5,113.6
Total	1,907.5	686.5	542.9	24,415.0	27,551.9

^a International ¼-inch rule.

Table 49.—Net volume of growing stock and sawtimber on commercial forest land in Kentucky, by stand-size class and geographic unit, 1975

Saw-Geographic unit	Timber stands	Pole-timber stands	Other stands	All stands
	<i>Million cubic feet</i>			
Western	478.4	271.1	71.4	820.9
Western Coalfield	1,163.5	502.5	271.6	1,937.6
Pennyroyal	1,450.3	561.0	159.0	2,170.3
Bluegrass	288.3	160.7	132.1	581.1
Northern Cumberland	1,170.1	574.4	227.4	1,971.9
Southern Cumberland	1,438.9	521.6	141.1	2,101.6
Eastern	1,347.1	368.6	144.6	1,860.3
Total	7,336.6	2,959.9	1,147.2	11,443.7
	<i>Million board feet^a</i>			
Western	1,407.9	459.0	108.7	1,975.6
Western Coalfield	3,409.1	753.0	491.2	4,653.3
Pennyroyal	4,323.2	793.5	296.5	5,413.2
Bluegrass	884.6	231.3	164.3	1,280.2
Northern Cumberland	3,094.4	745.4	392.7	4,232.5
Southern Cumberland	3,895.6	772.0	215.9	4,883.5
Eastern	4,267.6	591.6	254.4	5,113.6
Total	21,282.4	4,345.8	1,923.7	27,551.9

^a International ¼-inch rule.

Table 50.—Net volume of growing stock and sawtimber on commercial forest land in Kentucky, by forest type group and geographic unit, 1975

Geographic unit	White and red pine	Loblolly/shortleaf pine	Oak/pine	<i>Million cubic feet</i>				Maple/beech/birch	All groups
				Oak/hickory	Oak-gum/cypress	Elm-ash/red maple			
Western	—	1.8	20.8	618.8	23.2	125.3	31.0	820.9	
Western Coalfield	—	26.1	68.0	1,495.2	34.4	186.0	127.9	1,937.6	
Pennyroyal	—	103.7	128.6	1,432.3	32.4	100.3	373.0	2,170.3	
Bluegrass	—	63.0	96.6	356.1	—	32.8	32.6	581.1	
Northern Cumberland	12.8	112.6	113.7	1,475.9	—	119.4	137.5	1,971.9	
Southern Cumberland	18.9	244.4	305.3	1,263.1	—	54.5	215.4	2,101.6	
Eastern	21.2	18.7	23.3	1,232.6	24.8	77.3	462.4	1,860.3	
Total	52.9	570.3	756.3	7,874.0	114.8	695.6	1,379.8	11,443.7	
<i>Million board feet^a</i>									
Western	—	2.2	31.5	1,518.1	71.3	287.1	65.4	1,975.6	
Western Coalfield	—	25.7	168.3	3,507.2	105.4	498.3	348.4	4,653.3	
Pennyroyal	—	155.0	339.7	3,603.7	51.1	226.7	1,037.0	5,413.2	
Bluegrass	—	132.9	156.6	852.5	—	50.8	87.4	1,280.2	
Northern Cumberland	27.9	203.3	242.2	3,151.5	—	237.0	370.6	4,232.5	
Southern Cumberland	42.2	536.5	704.0	2,925.1	—	72.9	602.8	4,883.5	
Eastern	57.5	42.9	29.4	3,374.6	89.6	181.5	1,338.1	5,113.6	
Total	127.6	1,098.5	1,671.7	18,932.7	317.4	1,554.3	3,849.7	27,551.9	

^a International 1/4-inch rule.

Table 51.—Net volume of growing stock on commercial forest land, by species and diameter class, Western Unit, Kentucky, 1975

(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	3.1	0.5	2.6	—	—	—	—	—	—	—	—
Hard pines	6.3	.9	1.0	2.4	2.0	—	—	—	—	—	—
Other softwoods	1.6	—	—	—	.5	—	0.6	0.5	—	—	—
Total softwoods	11.0	1.4	3.6	2.4	2.5	—	0.6	0.5	—	—	—
Select white oaks	127.2	9.9	13.9	17.5	17.6	20.9	23.6	16.5	2.3	4.4	0.6
Select red oaks	64.0	3.4	7.0	6.9	9.4	7.0	6.9	3.9	2.3	15.7	1.5
Other white oaks	90.4	7.3	14.0	16.3	17.9	14.6	8.7	6.7	2.7	.7	1.5
Other red oaks	147.0	9.5	14.4	18.0	20.1	22.4	18.4	17.3	9.2	14.2	3.5
Red maple	13.3	1.8	2.3	1.2	.6	1.4	2.1	—	2.3	.8	.8
Sugar maple	30.1	2.0	7.0	6.9	6.4	3.7	2.5	.8	—	.8	—
Hickory	105.2	14.8	15.6	17.1	16.9	16.7	12.4	7.8	2.4	1.5	—
Beech	10.5	.6	—	2.5	—	1.3	.7	.8	.8	1.7	2.1
Ash	36.2	8.1	8.8	7.5	2.8	.8	4.0	2.5	1.7	—	—
Black walnut	4.4	.9	1.0	.6	.6	1.3	—	—	—	—	—
Sweetgum	28.4	3.9	1.1	3.2	4.8	4.1	6.8	.7	2.3	1.5	—
Yellow-poplar	6.7	1.2	—	.6	.7	2.0	.7	.7	.8	—	—
Blackgum	17.4	.6	4.0	3.7	3.3	2.9	1.5	—	.8	.6	—
Other hardwoods	129.1	30.5	17.3	19.0	19.7	7.5	12.2	7.2	3.0	8.1	4.6
Total hardwoods	809.9	94.5	106.4	121.0	120.8	106.6	100.5	64.9	30.6	50.0	14.6
All species	820.9	95.9	110.0	123.4	123.3	106.6	101.1	65.4	30.6	50.0	14.6

Table 52.—Net volume of growing stock on commercial forest land, by species and diameter class, Western Coalfield Unit, Kentucky, 1975

(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	18.6	10.3	2.7	4.3	0.6	0.7	—	—	—	—	—
Hard pines	7.6	—	.5	2.9	2.5	—	1.7	—	—	—	—
Other softwoods	5.1	—	.7	—	—	—	—	—	0.9	3.5	—
Total softwoods	31.3	10.3	3.9	7.2	3.1	0.7	1.7	—	0.9	3.5	—
Select white oaks	271.0	11.9	25.1	42.6	44.3	51.0	37.5	21.4	11.8	25.4	—
Select red oaks	134.1	6.2	9.2	13.1	15.2	12.7	28.2	7.3	10.3	30.9	1.0
Other white oaks	137.6	12.5	18.4	23.3	27.3	24.4	13.1	9.7	2.4	3.8	2.7
Other red oaks	253.0	22.1	19.2	26.9	39.7	37.4	30.4	18.1	11.8	36.1	11.3
Red maple	87.4	9.2	8.5	13.0	9.8	13.5	9.8	9.1	3.2	6.4	4.9
Sugar maple	111.2	14.3	17.0	17.7	12.1	12.3	16.5	12.5	3.6	5.2	—
Hickory	308.5	41.0	31.0	65.9	50.6	37.7	34.7	25.2	7.2	14.1	1.1
Beech	51.3	2.8	.9	4.7	8.1	6.2	9.0	2.5	1.0	12.5	3.6
Ash	96.6	19.3	15.9	15.6	15.1	10.0	11.3	4.6	2.1	2.7	—
Black walnut	24.6	1.5	4.1	4.7	7.1	3.4	1.2	1.3	—	1.3	—
Sweetgum	66.7	4.0	12.5	14.1	17.1	9.3	3.6	2.3	1.3	2.5	—
Yellow-poplar	98.4	5.1	4.1	16.4	12.1	16.8	13.2	9.0	7.5	10.4	3.8
Blackgum	52.6	6.2	5.8	13.9	8.4	7.6	4.6	3.6	—	2.5	—
Other hardwoods	213.3	44.8	35.8	34.4	26.9	19.9	11.9	13.1	15.1	9.1	2.3
Total hardwoods	1,906.3	200.9	207.5	306.3	293.8	262.2	225.0	139.7	77.3	162.9	30.7
All species	1,937.6	211.2	211.4	313.5	296.9	262.9	226.7	139.7	78.2	166.4	30.7

Table 53.—Net volume of growing stock on commercial forest land, by species and diameter class, Pennyroyal Unit, Kentucky, 1975

(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.8	21.0-28.9	29.0+
Redcedar	55.8	22.8	17.6	5.6	3.4	2.7	1.9	1.8	—	—	—
Hard pines	62.6	7.3	14.5	12.1	13.5	9.0	4.0	1.1	1.1	—	—
Total softwoods	118.4	30.1	32.1	17.7	16.9	11.7	5.9	2.9	1.1	—	—
Select white oaks	333.0	16.9	33.7	43.5	63.4	46.8	64.0	37.5	6.6	20.6	—
Select red oaks	124.3	3.8	13.2	11.2	21.0	13.8	16.7	16.2	13.6	14.0	0.8
Other white oaks	203.7	15.2	16.5	25.2	26.7	39.7	36.3	25.3	12.3	6.5	—
Other red oaks	306.2	21.3	27.7	46.2	40.4	41.9	42.2	31.3	23.4	28.4	3.4
Red maple	59.5	10.3	15.7	7.0	4.0	5.1	3.0	3.4	3.4	2.6	5.0
Sugar maple	147.0	32.7	27.7	20.1	15.0	15.4	16.7	13.3	3.1	3.0	—
Hickory	264.2	30.6	35.3	62.8	42.8	47.2	14.8	12.8	7.7	10.2	—
Beech	138.2	6.3	9.2	10.2	15.0	18.3	21.1	21.7	11.9	18.7	5.8
Ash	72.5	4.7	7.2	14.8	20.6	11.6	4.0	4.1	1.8	3.0	.7
Black walnut	24.6	3.3	4.5	3.5	6.6	5.7	—	—	—	1.0	—
Sweetgum	19.6	4.5	3.1	2.6	3.6	3.9	—	.9	1.0	—	—
Yellow-poplar	161.8	15.6	21.5	18.0	25.5	16.7	17.7	16.4	11.7	16.5	2.2
Blackgum	45.5	6.0	8.5	4.2	14.8	4.9	2.0	4.1	1.0	—	—
Basswood	5.2	—	—	.9	2.1	—	1.1	—	1.1	—	—
Other hardwoods	146.6	17.0	23.7	28.0	19.6	15.0	12.0	9.3	6.1	11.5	4.4
Total hardwoods	2,051.9	188.2	247.5	298.2	321.1	286.0	251.6	196.3	104.7	136.0	22.3
All species	2,170.3	218.3	279.6	315.9	338.0	297.7	257.5	199.2	105.8	136.0	22.3

Table 54.—Net volume of growing stock on commercial forest land, by species and diameter class, Bluegrass Unit, Kentucky, 1975
(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	33.7	15.9	7.5	3.9	1.9	2.2	1.5	0.8	—	—	—
Hard pines	17.2	1.8	4.4	5.2	2.7	2.3	.8	—	—	—	—
Total softwoods	50.9	17.7	11.9	9.1	4.6	4.5	2.3	0.8	—	—	—
Select white oaks	71.2	10.8	7.6	9.4	11.1	8.0	7.9	4.2	1.8	8.7	1.7
Select red oaks	35.4	—	2.6	4.9	4.5	4.0	3.4	6.5	3.7	5.0	.8
Other white oaks	25.9	2.3	4.5	5.4	3.4	—	3.4	3.4	1.7	1.8	—
Other red oaks	39.5	4.3	6.4	9.2	7.4	2.4	2.6	.9	2.8	3.5	—
Red maple	14.2	3.6	1.0	.7	1.4	2.3	.9	—	2.5	1.0	.8
Sugar maple	40.7	4.3	8.4	8.0	4.0	5.6	4.3	.9	.9	4.3	—
Hickory	87.4	9.7	12.0	19.1	11.9	14.2	5.9	7.7	4.3	2.6	—
Beech	1.8	—	—	—	—	—	—	.9	—	.9	—
Ash	56.6	3.3	11.8	9.4	7.0	6.9	5.5	4.1	4.2	3.6	.8
Black walnut	30.1	6.6	4.8	4.5	3.7	3.9	3.9	.9	1.0	.8	—
Yellow-poplar	13.7	.6	.7	.7	2.3	4.2	1.7	.9	—	2.6	—
Blackgum	2.8	1.2	—	—	—	1.6	—	—	—	—	—
Basswood	9.0	.6	—	—	1.6	1.8	1.9	2.1	1.0	—	—
Other hardwoods	101.9	18.8	18.8	19.7	15.8	3.9	4.2	9.6	4.5	5.8	.8
Total hardwoods	530.2	66.1	78.6	91.0	74.1	58.8	45.6	42.1	28.4	40.6	4.9
All species	581.1	83.8	90.5	100.1	78.7	63.6	47.9	42.9	28.4	40.6	4.9

Table 55.—Net volume of growing stock on commercial forest land, by species and diameter class, Northern Cumberland Unit, Kentucky, 1975
(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	1.6	0.8	0.8	—	—	—	—	—	—	—	—
Hard pines	180.1	26.3	36.4	50.6	31.5	21.3	11.6	2.4	—	—	—
Other softwoods	24.9	2.3	1.8	6.2	3.8	1.9	4.0	1.0	3.1	—	0.8
Total softwoods	206.6	29.4	39.0	56.8	35.3	23.2	15.6	3.4	3.1	—	0.8
Select white oaks	286.3	28.4	35.7	51.4	58.0	49.8	30.6	15.3	6.3	10.8	—
Select red oaks	98.3	7.4	5.1	10.7	4.7	16.3	17.0	7.9	8.5	20.7	—
Other white oaks	266.2	22.3	32.7	45.6	47.9	42.9	25.5	15.2	15.0	13.8	5.3
Other red oaks	396.8	34.0	52.0	49.7	56.3	65.8	58.7	30.8	22.2	22.2	5.1
Red maple	84.8	25.1	8.9	18.2	6.2	6.8	9.3	4.4	4.6	1.3	—
Sugar maple	18.5	4.4	2.7	2.6	2.9	.9	3.1	—	1.0	.9	—
Hickory	240.0	48.4	51.0	53.1	28.4	29.3	11.7	5.2	5.9	7.0	—
Beech	60.7	3.2	4.8	5.2	3.5	5.5	3.8	3.9	8.5	18.3	4.0
Ash	21.4	1.4	4.2	1.8	3.2	3.1	4.5	1.2	—	2.0	—
Black walnut	9.8	—	.6	2.6	2.0	1.1	3.5	—	—	—	—
Sweetgum	4.9	—	—	1.9	2.0	1.0	—	—	—	—	—
Yellow-poplar	184.1	19.8	22.7	31.4	29.5	21.8	24.3	12.6	13.6	8.4	—
Blackgum	21.8	1.7	5.8	3.5	2.9	3.9	2.1	1.9	—	—	—
Basswood	9.4	.8	—	3.1	1.1	2.2	—	1.2	—	1.0	—
Other hardwoods	62.3	13.5	15.1	10.8	9.8	6.8	3.9	1.1	—	1.3	—
Total hardwoods	1,765.3	210.4	241.3	291.6	258.4	257.2	198.0	100.7	85.6	107.7	14.4
All species	1,971.9	239.8	280.3	348.4	293.7	280.4	213.6	104.1	88.7	107.7	15.2

Table 56.—Net volume of growing stock on commercial forest land, by species and diameter class, Southern Cumberland Unit, Kentucky, 1975

(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	3.3	1.4	—	—	1.3	—	0.6	—	—	—	—
Hard pines	323.2	39.7	62.4	80.9	80.2	35.7	18.0	4.5	1.8	—	—
Other softwoods	31.5	3.3	3.6	5.4	3.2	2.3	2.6	1.7	1.8	6.8	0.8
Total softwoods	358.0	44.4	66.0	86.3	84.7	38.0	21.2	6.2	3.6	6.8	0.8
Select white oaks	281.3	44.3	43.0	56.4	39.8	25.0	26.8	23.4	9.0	11.7	1.9
Select red oaks	98.4	11.1	8.8	9.9	9.5	16.1	16.8	7.2	8.3	9.0	1.7
Other white oaks	167.4	22.3	18.8	32.3	24.3	21.6	21.3	9.6	5.8	10.8	.6
Other red oaks	300.1	17.7	32.5	41.6	40.3	53.8	49.8	33.8	14.4	16.2	—
Red maple	74.4	22.0	18.1	7.6	6.9	12.2	5.1	—	1.7	.8	—
Sugar maple	38.0	8.4	8.3	7.2	7.0	5.5	.9	—	—	.7	—
Hickory	246.4	45.9	41.3	46.9	32.8	26.2	20.4	14.6	7.9	10.4	—
Beech	72.2	4.7	5.8	4.2	4.8	6.7	7.1	5.9	8.8	18.0	6.2
Ash	25.0	5.2	4.0	4.1	3.6	4.0	.9	1.1	—	2.1	—
Black walnut	16.6	.7	5.6	2.2	3.4	3.8	—	—	.9	—	—
Sweetgum	8.4	2.4	2.8	3.2	—	—	—	—	—	—	—
Yellow-poplar	268.9	28.7	38.3	45.6	41.8	48.9	24.0	23.5	7.1	8.4	2.6
Blackgum	39.6	7.5	2.9	1.7	6.6	5.1	4.4	5.5	2.6	3.3	—
Basswood	23.2	5.8	2.4	1.8	7.6	1.0	1.2	2.2	—	1.2	—
Other hardwoods	83.7	21.1	20.7	10.6	8.5	11.7	2.9	2.9	2.9	2.4	—
Total hardwoods	1,743.6	247.8	253.3	275.3	236.9	241.6	181.6	129.7	69.4	95.0	13.0
All species	2,101.6	292.2	319.3	361.6	321.6	279.6	202.8	135.9	73.0	101.8	13.8

Table 57.—Net volume of growing stock on commercial forest land, by species and diameter class, Eastern Unit, Kentucky, 1975

(In millions of cubic feet)

Species	All classes	Diameter class (inches at breast height)									
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Hard pines	64.2	6.9	14.4	15.2	12.6	5.1	5.3	4.0	0.7	—	—
Other softwoods	22.1	—	2.2	5.5	2.0	3.6	1.3	2.2	2.8	2.5	—
Total softwoods	86.3	6.9	16.6	20.7	14.6	8.7	6.6	6.2	3.5	2.5	—
Select white oaks	149.0	20.1	13.1	13.7	13.9	19.7	26.6	12.6	12.8	14.8	1.7
Select red oaks	98.0	3.6	5.8	6.9	9.9	12.1	8.4	13.6	9.6	22.9	5.2
Other white oaks	190.1	9.5	14.9	18.5	18.0	19.6	18.1	20.7	18.2	31.4	21.2
Other red oaks	302.0	20.8	26.3	33.3	32.1	49.0	48.8	42.5	19.1	24.5	5.6
Red maple	76.2	18.5	14.3	6.0	11.0	6.9	6.1	4.3	2.4	6.1	.6
Sugar maple	55.9	7.8	6.1	8.5	10.7	4.9	5.7	4.8	3.2	4.2	—
Hickory	244.3	24.5	31.0	28.0	37.6	38.6	34.9	23.7	10.5	10.7	4.8
Beech	151.5	4.2	12.1	11.2	12.4	13.0	12.7	18.9	18.1	43.2	5.7
Ash	27.6	1.6	4.0	9.8	2.5	5.0	2.1	1.3	—	1.3	—
Black walnut	14.8	4.8	1.2	3.2	2.1	—	3.5	—	—	—	—
Sweetgum	2.0	—	.5	.6	—	—	—	—	—	.9	—
Yellow-poplar	274.3	32.8	42.3	56.4	43.3	37.0	27.8	14.0	7.1	12.6	1.0
Blackgum	41.4	2.1	4.0	2.9	5.9	7.5	7.0	6.0	4.9	1.1	—
Basswood	60.6	9.9	8.9	9.0	5.7	6.4	7.9	3.9	5.2	3.7	—
Other hardwoods	86.3	17.7	7.1	14.0	17.9	7.7	6.0	3.1	5.1	6.5	1.2
Total hardwoods	1,774.0	177.9	191.6	222.0	223.0	227.4	215.6	169.4	116.2	183.9	47.0
All species	1,860.3	184.8	208.2	242.7	237.6	236.1	222.2	175.6	119.7	186.4	47.0

Table 58.—Net volume of sawtimber on commercial forest land, by species and diameter class, Western Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Hard pines	14.4	6.8	7.6	—	—	—	—	—	—
Other softwoods	6.1	—	1.4	—	2.6	2.1	—	—	—
Total softwoods	20.5	6.8	9.0	—	2.6	2.1	—	—	—
Select white oaks	344.8	—	59.8	82.3	97.1	72.1	9.9	20.5	3.1
Select red oaks	196.0	—	31.8	27.1	29.2	17.1	10.0	74.1	6.7
Other white oaks	204.0	—	60.4	58.0	35.9	27.8	12.2	3.1	6.6
Other red oaks	430.4	—	68.5	87.7	75.1	76.4	41.0	65.5	16.2
Red maples	32.9	—	2.0	5.1	8.3	—	10.2	3.6	3.7
Sugar maple	53.6	—	21.4	14.7	10.6	3.4	—	3.5	—
Hickory	225.0	—	57.7	65.2	51.6	33.5	10.5	6.5	—
Beech	33.3	—	—	5.4	2.7	3.1	3.5	8.1	10.5
Ash	47.0	—	9.9	2.9	16.1	10.4	7.7	—	—
Black walnut	6.9	—	2.0	4.9	—	—	—	—	—
Sweetgum	81.1	—	16.0	16.7	28.0	3.1	10.5	6.8	—
Yellow-poplar	20.4	—	2.4	7.8	3.3	2.9	4.0	—	—
Blackgum	34.2	—	11.0	10.7	6.0	—	3.4	3.1	—
Other hardwoods	245.5	—	64.6	28.6	49.2	31.1	13.0	36.7	22.3
Total hardwoods	1,955.1	—	407.5	417.1	413.1	280.9	135.9	231.5	69.1
All species	1,975.6	6.8	416.5	417.1	415.7	283.0	135.9	231.5	69.1

^a International 1/4-inch rule.

Table 59.—Net volume of sawtimber on commercial forest land, by species and diameter class, Western Coalfield Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	18.6	13.6	2.4	2.6	—	—	—	—	—
Hard pines	26.7	10.3	9.6	—	6.8	—	—	—	—
Other softwoods	17.3	—	—	—	—	—	4.1	13.2	—
Total softwoods	62.6	23.9	12.0	2.6	6.8	—	4.1	13.2	—
Select white oaks	733.4	—	145.0	189.9	149.2	89.1	48.8	111.4	—
Select red oaks	420.5	—	48.3	47.7	111.0	29.2	42.4	137.0	4.9
Other white oaks	311.0	—	89.0	91.3	51.6	40.5	10.7	16.5	11.4
Other red oaks	729.0	—	130.4	142.5	119.7	74.9	50.7	159.9	50.9
Red maple	219.4	—	31.8	49.7	38.7	35.9	13.7	27.3	22.3
Sugar maple	236.5	—	37.8	45.9	63.8	49.6	15.3	24.1	—
Hickory	647.5	—	165.5	141.0	135.9	105.9	31.6	62.3	5.3
Beech	172.6	—	26.3	23.0	35.1	10.0	5.0	56.5	16.7
Ash	170.3	—	48.6	37.1	45.3	18.2	9.0	12.1	—
Black walnut	51.2	—	22.4	13.3	4.7	5.2	—	5.6	—
Sweetgum	133.7	—	56.8	35.3	15.1	9.7	6.2	10.6	—
Yellow-poplar	285.1	—	39.8	63.1	53.1	37.2	30.7	44.8	16.4
Blackgum	100.2	—	27.7	27.7	17.7	16.5	—	10.6	—
Other hardwoods	380.3	—	87.3	73.2	47.2	54.2	65.7	41.8	10.9
Total hardwoods	4,590.7	—	956.7	980.7	888.1	576.1	329.8	720.5	138.8
All species	4,653.3	23.9	968.7	983.3	894.9	576.1	333.9	733.7	138.8

^a International 1/4-inch rule.

Table 60.—Net volume of sawtimber on commercial forest land, by species and diameter class, Pennyroyal Unit, Kentucky, 1975
(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	52.0	18.9	12.4	7.2	7.3	6.2	—	—	—
Hard pines	148.0	43.5	49.8	31.8	14.7	4.1	4.1	—	—
Total softwoods	200.0	62.4	62.2	39.0	22.0	10.3	4.1	—	—
Select white oaks	942.2	—	214.7	179.3	263.1	161.9	29.0	94.2	—
Select red oaks	386.5	—	70.5	51.3	67.3	69.4	60.1	64.1	3.8
Other white oaks	573.3	—	88.8	147.8	145.2	108.2	53.8	29.5	—
Other red oaks	852.3	—	136.6	157.9	172.9	133.3	104.9	130.8	15.9
Red maple	108.7	—	13.4	18.8	11.9	14.4	15.1	12.1	23.0
Sugar maple	260.1	—	50.7	58.7	66.9	56.7	13.6	13.5	—
Hickory	521.9	—	144.6	180.8	61.1	53.7	34.5	47.2	—
Beech	462.4	—	50.3	69.1	84.7	92.5	51.9	86.9	27.0
Ash	168.4	—	67.2	43.3	15.4	17.6	7.9	13.3	3.7
Black walnut	48.0	—	22.5	20.9	—	—	—	4.6	—
Sweetgum	35.0	—	12.0	14.5	—	4.0	4.5	—	—
Yellow-poplar	432.9	—	86.0	63.7	74.3	70.2	51.8	76.3	10.6
Blackgum	96.9	—	48.9	18.1	8.4	17.0	4.5	—	—
Basswood	16.1	—	7.1	—	4.3	—	4.7	—	—
Other hardwoods	308.5	—	65.1	55.8	47.8	39.2	26.4	53.1	21.1
Total hardwoods	5,213.2	—	1,078.4	1,080.0	1,023.3	838.1	462.7	625.6	105.1
All species	5,413.2	62.4	1,140.6	1,119.0	1,045.3	848.4	466.8	625.6	105.1

^a International ¼-inch rule.

Table 61.—Net volume of sawtimber on commercial forest land, by species and diameter class, Bluegrass Unit, Kentucky, 1975
(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	38.1	13.5	5.5	8.8	6.7	3.6	—	—	—
Hard pines	39.7	18.8	9.7	7.7	3.5	—	—	—	—
Total softwoods	77.8	32.3	15.2	16.5	10.2	3.6	—	—	—
Select white oaks	177.7	—	40.0	31.4	32.7	18.2	8.2	39.8	7.4
Select red oaks	117.6	—	16.2	15.8	14.3	27.7	16.9	23.1	3.6
Other white oaks	57.0	—	12.4	—	14.5	15.0	7.1	8.0	—
Other red oaks	79.0	—	26.7	9.2	9.9	4.3	12.9	16.0	—
Red maple	36.6	—	5.0	9.0	3.2	—	10.9	4.8	3.7
Sugar maple	81.8	—	14.4	22.3	17.8	3.9	3.7	19.7	—
Hickory	187.6	—	42.8	55.7	24.0	33.6	18.9	12.6	—
Beech	8.1	—	—	—	—	3.7	—	4.4	—
Ash	130.9	—	25.1	26.8	22.2	17.8	18.3	17.1	3.6
Black walnut	57.7	—	13.5	15.5	16.3	4.2	4.5	3.7	—
Yellow-poplar	47.4	—	8.2	16.1	7.1	4.3	—	11.7	—
Blackgum	5.9	—	—	5.9	—	—	—	—	—
Basswood	34.3	—	5.9	7.3	7.4	9.6	4.1	—	—
Other hardwoods	180.8	—	56.0	15.6	17.4	41.3	20.2	26.6	3.7
Total hardwoods	1,202.4	—	266.2	230.6	186.8	183.6	125.7	187.5	22.0
All species	1,280.2	32.3	281.4	247.1	197.0	187.2	125.7	187.5	22.0

^a International ¼-inch rule.

Table 62.—Net volume of sawtimber on commercial forest land, by species and diameter class, Northern Cumberland Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Hard pines	411.6	164.3	115.3	77.1	44.4	10.5	—	—	—
Other softwoods	77.4	23.0	13.7	7.2	14.9	3.8	12.9	—	1.9
Total softwoods	489.0	187.3	129.0	84.3	59.3	14.3	12.9	—	1.9
Select white oaks	611.8	—	189.4	176.6	114.6	59.4	25.4	46.4	—
Select red oaks	289.5	—	15.4	57.3	63.0	30.7	34.2	88.9	—
Other white oaks	604.7	—	156.3	151.4	94.6	59.1	60.7	59.2	23.4
Other red oaks	958.3	—	182.1	230.9	217.2	119.7	89.6	96.3	22.5
Red maple	119.1	—	20.0	23.9	34.5	16.9	18.4	5.4	—
Sugar maple	31.6	—	9.2	3.1	11.3	—	4.1	3.9	—
Hickory	311.1	—	91.9	101.9	42.8	20.0	24.0	30.5	—
Beech	191.3	—	11.1	18.5	13.8	15.1	34.3	80.6	17.9
Ash	50.0	—	10.1	10.5	16.5	4.5	—	8.4	—
Black walnut	22.7	—	6.2	3.9	12.6	—	—	—	—
Sweetgum	10.5	—	6.7	3.8	—	—	—	—	—
Yellow-poplar	404.5	—	96.6	77.2	90.4	49.3	55.2	35.8	—
Blackgum	37.7	—	9.6	13.4	7.6	7.1	—	—	—
Basswood	20.5	—	3.6	7.5	—	4.8	—	4.6	—
Other hardwoods	80.2	—	32.3	24.0	14.5	4.1	—	5.3	—
Total hardwoods	3,743.5	—	840.5	903.9	733.4	390.7	345.9	465.3	63.8
All species	4,232.5	187.3	969.5	988.2	792.7	405.0	358.8	465.3	65.7

^a International ¼-inch rule.

Table 63.—Net volume of sawtimber on commercial forest land, by species and diameter class, Southern Cumberland Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Redcedar	7.5	—	4.9	—	2.6	—	—	—	—
Hard pines	789.6	252.7	293.1	140.9	75.6	19.3	8.0	—	—
Other softwoods	101.5	16.9	11.5	8.9	10.8	7.7	8.4	33.1	4.2
Total softwoods	898.6	269.6	309.5	149.8	89.0	27.0	16.4	33.1	4.2
Select white oaks	569.3	—	144.0	96.6	112.0	104.7	43.1	58.7	10.2
Select red oaks	292.4	—	35.0	62.3	69.4	32.0	39.0	46.1	8.6
Other white oaks	385.1	—	85.5	83.2	89.5	42.3	26.9	54.6	3.1
Other red oaks	861.5	—	145.1	208.5	206.4	151.4	67.3	82.8	—
Red maple	103.8	—	23.9	47.1	21.2	—	7.5	4.1	—
Sugar maple	53.1	—	24.3	21.1	4.0	—	—	3.7	—
Hickory	457.5	—	117.3	101.3	84.9	64.9	36.4	52.7	—
Beech	261.0	—	17.6	25.7	29.7	25.9	40.8	90.3	31.0
Ash	47.4	—	13.0	15.3	3.8	4.8	—	10.5	—
Black walnut	30.0	—	11.6	14.4	—	—	4.0	—	—
Yellow-poplar	633.3	—	149.9	188.9	100.2	105.3	32.9	42.9	13.2
Blackgum	113.3	—	22.8	19.5	18.2	24.6	11.7	16.5	—
Basswood	50.9	—	26.8	3.8	4.8	9.8	—	5.7	—
Other hardwoods	126.3	—	30.2	44.7	12.0	13.3	13.9	12.2	—
Total hardwoods	3,984.9	—	847.0	932.4	756.1	579.0	323.5	480.8	66.1
All species	4,883.5	269.6	1,156.5	1,082.2	845.1	606.0	339.9	513.9	70.3

^a International ¼-inch rule.

Table 64.—Net volume of sawtimber on commercial forest land, by species and diameter class, Eastern Unit, Kentucky, 1975
(In millions of board feet)^a

Species	All classes	Diameter class (inches at breast height)							
		9.0-10.9	11.0-12.9	13.0-14.9	15.0-16.9	17.0-18.9	19.0-20.9	21.0-28.9	29.0+
Hard pines	147.9	47.5	44.7	19.1	17.6	15.8	3.2	—	—
Other softwoods	70.6	17.7	6.4	13.5	5.0	8.4	9.9	9.7	—
Total softwoods	218.5	65.2	51.1	32.6	22.6	24.2	13.1	9.7	—
Select white oaks	427.8	—	46.5	75.3	107.3	52.5	56.3	81.3	8.6
Select red oaks	352.9	—	32.1	45.6	33.6	56.5	42.4	117.9	24.8
Other white oaks	640.3	—	57.8	73.3	73.9	86.3	80.1	169.3	99.6
Other red oaks	921.7	—	103.6	185.0	198.2	177.8	84.8	138.2	34.1
Red maple	148.0	—	36.4	25.9	25.2	17.9	10.1	29.5	3.0
Sugar maple	131.9	—	34.3	18.7	23.6	20.5	14.6	19.9	.3
Hickory	640.7	—	122.1	145.9	141.1	99.8	46.2	62.9	22.7
Beech	549.2	—	40.8	48.6	51.8	78.8	82.0	218.5	28.7
Ash	46.6	—	8.1	18.7	8.6	5.3	—	5.9	—
Black walnut	21.2	—	6.7	—	14.5	—	—	—	—
Sweetgum	4.7	—	—	—	—	—	—	4.7	—
Yellow-poplar	566.3	—	143.9	141.4	113.4	59.2	31.9	71.5	5.0
Blackgum	127.7	—	19.3	28.4	28.2	25.4	21.6	4.8	—
Basswood	132.9	—	18.7	23.9	32.7	16.5	23.6	17.5	—
Other hardwoods	183.2	—	58.4	28.6	25.0	12.9	22.5	29.8	6.0
Total hardwoods	4,895.1	—	728.7	859.3	877.1	709.4	516.1	971.7	232.8
All species	5,113.6	65.2	779.8	891.9	899.7	733.6	529.2	981.4	232.8

^a International ¼-inch rule.

Table 65.—Net volume of sawtimber on commercial forest land, by species and quality class, Western Unit, Kentucky, 1975
(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	14.4	—	0.9	13.5	—
Other softwoods ^c	6.1	—	—	—	—
Total softwoods	20.5	—	0.9	13.5	—
Hardwoods					
Select white oaks	344.8	14.7	66.5	230.3	33.3
Select red oaks	196.0	13.6	62.5	100.8	19.1
Other white oaks	204.0	6.3	21.2	128.6	47.9
Other red oaks	430.4	21.2	65.5	290.8	52.9
Red maple	32.9	—	8.0	15.4	9.5
Sugar maple	53.6	5.2	3.1	22.1	23.2
Hickory	225.0	6.6	34.8	132.4	51.2
Beech	33.3	.2	—	20.8	12.3
Ash	47.0	10.7	13.2	14.7	8.4
Black walnut	6.9	—	—	6.2	.7
Sweetgum	81.1	11.8	14.3	46.8	8.2
Yellow-poplar	20.4	5.5	5.2	7.0	2.7
Blackgum	34.2	1.2	4.9	24.2	3.9
Other hardwoods	245.5	24.9	34.5	137.8	48.3
Total hardwoods	1,955.1	121.9	333.7	1,177.9	321.6
Hardwood quality (%)	100	6	17	60	17

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard-lumber grades.

Table 66.—Net volume of sawtimber on commercial forest land, by species and quality class, Western Coalfield Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	26.7	—	—	26.7	—
Other softwoods ^c	35.9	—	—	—	—
Total softwoods	62.6	—	—	26.7	—
Hardwoods					
Select white oaks	733.4	79.3	148.0	404.0	102.1
Select red oaks	420.5	49.3	150.1	176.4	44.7
Other white oaks	311.0	19.8	41.5	189.0	60.7
Other red oaks	729.0	134.1	139.2	353.7	102.0
Red maple	219.4	10.0	40.6	107.5	61.3
Sugar maple	236.5	24.9	38.5	129.4	43.7
Hickory	647.5	53.4	109.2	385.8	99.1
Beech	172.6	.6	10.4	86.4	75.2
Ash	170.3	22.6	27.7	89.3	30.7
Black walnut	51.2	10.1	15.8	22.0	3.3
Sweetgum	133.7	14.9	21.6	82.7	14.5
Yellow-poplar	285.1	55.6	69.8	125.4	34.3
Blackgum	100.2	9.0	16.9	64.9	9.4
Other hardwoods	380.3	35.8	63.1	228.3	53.1
Total hardwoods	4,590.7	519.4	892.4	2,444.8	734.1
Hardwood quality (%)	100	11	20	53	16

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard-lumber grades.

Table 67.—Net volume of sawtimber on commercial forest land, by species and quality class, Pennyroyal Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	148.0	17.6	26.5	103.9	—
Other softwoods ^c	52.0	—	—	—	—
Total softwoods	200.0	17.6	26.5	103.9	—
Hardwoods					
Select white oaks	942.2	153.1	196.1	418.0	175.0
Select red oaks	386.5	103.3	98.0	142.5	42.7
Other white oaks	573.3	102.0	129.3	251.0	91.0
Other red oaks	852.3	147.6	182.8	347.4	174.5
Red maple	108.7	20.2	20.2	34.4	33.9
Sugar maple	260.1	22.5	68.5	117.6	51.5
Hickory	521.9	64.0	100.8	230.2	126.9
Beech	462.4	13.1	33.5	174.8	241.0
Ash	168.4	14.5	46.7	62.2	45.0
Black walnut	48.0	3.0	10.0	31.1	3.9
Sweetgum	35.0	1.1	6.2	20.8	6.9
Yellow-poplar	432.9	129.0	70.8	120.6	112.5
Blackgum	96.9	5.8	17.0	61.4	12.7
Basswood	16.1	—	5.8	9.1	1.2
Other hardwoods	308.5	39.6	76.3	138.3	54.3
Total hardwoods	5,213.2	818.8	1,062.0	2,159.4	1,173.0
Hardwood quality (%)	100	16	20	41	23

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard lumber grades.

Table 68.—Net volume of sawtimber on commercial forest land by species and quality class, Bluegrass Unit, Kentucky, 1975
(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	39.7	—	3.1	36.6	—
Other softwoods ^c	38.1	—	—	—	—
Total softwoods	77.8	—	3.1	36.6	—
Hardwoods					
Select white oaks	177.7	26.9	46.4	83.7	20.7
Select red oaks	117.6	30.2	25.1	42.8	19.5
Other white oaks	57.0	13.4	13.2	25.5	4.9
Other red oaks	79.0	10.3	14.7	36.6	17.4
Red maple	36.6	6.4	6.8	18.2	5.2
Sugar maple	81.8	17.7	8.2	30.0	25.9
Hickory	187.6	12.7	30.7	111.0	33.2
Beech	8.1	—	—	3.2	4.9
Ash	130.9	23.9	35.2	35.9	35.9
Black walnut	57.7	7.8	13.6	30.9	5.4
Yellow-poplar	47.4	13.4	15.8	13.0	5.2
Blackgum	5.9	—	—	5.4	.5
Basswood	34.3	8.4	9.3	14.3	2.3
Other hardwoods	180.8	15.1	27.5	101.1	37.1
Total hardwoods	1,202.4	186.2	246.5	551.6	218.1
Hardwood quality (%)	100	15	21	46	18

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard-lumber grades.

Table 69.—Net volume of sawtimber on commercial forest land, by species and quality class, Northern Cumberland Unit, Kentucky, 1975
(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 2	Grade 1	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	411.6	5.3	25.8	380.5	—
Other softwoods ^c	77.4	—	—	—	—
Total softwoods	489.0	5.3	25.8	380.5	—
Hardwoods					
Select white oaks	611.8	16.4	65.7	387.0	142.7
Select red oaks	289.5	22.1	70.9	139.3	57.2
Other white oaks	604.7	11.9	62.1	376.1	154.6
Other red oaks	958.3	33.5	100.4	593.2	231.2
Red maple	119.1	2.8	11.1	82.1	23.1
Sugar maple	31.6	—	.6	17.3	13.7
Hickory	311.1	13.9	31.9	216.9	48.4
Beech	191.3	.4	2.8	113.5	74.6
Ash	50.0	2.8	11.7	21.8	13.7
Black walnut	22.7	—	6.0	14.4	2.3
Sweetgum	10.5	.1	.1	6.5	3.8
Yellow-poplar	404.5	24.4	54.6	229.0	96.5
Blackgum	37.7	2.4	1.2	28.8	5.3
Basswood	20.5	—	3.0	12.7	4.8
Other hardwoods	80.2	.3	17.5	45.4	17.0
Total hardwoods	3,743.5	131.0	439.6	2,284.0	888.9
Hardwood quality (%)	100	3	12	61	24

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard lumber grades.

Table 70.—Net volume of sawtimber on commercial forest land, by species and quality class, Southern Cumberland Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	789.6	58.3	109.4	621.9	—
Other softwoods ^c	109.0	—	—	—	—
Total softwoods	898.6	58.3	109.4	621.9	—
Hardwoods					
Select white oaks	569.3	70.9	137.1	298.4	62.9
Select red oaks	292.4	82.0	52.6	115.6	42.2
Other white oaks	385.1	57.4	85.5	176.6	65.6
Other red oaks	861.5	124.4	194.1	380.2	162.8
Red maple	103.8	8.2	20.4	51.9	23.3
Sugar maple	53.1	8.1	7.0	32.1	5.9
Hickory	457.5	64.8	102.5	198.3	91.9
Beech	261.0	3.7	36.3	173.3	47.7
Ash	47.4	6.2	15.6	16.2	9.4
Black walnut	30.0	—	5.3	21.4	3.3
Yellow-poplar	633.3	91.7	111.9	223.6	206.1
Blackgum	113.3	17.9	26.8	53.5	15.1
Basswood	50.9	5.4	5.4	36.3	3.8
Other hardwoods	126.3	5.9	26.1	64.5	29.8
Total hardwoods	3,984.9	546.6	826.6	1,841.9	769.8
Hardwood quality (%)	100	14	21	46	19

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard lumber grades.

Table 71.—Net volume of sawtimber on commercial forest land, by species and quality class, Eastern Unit, Kentucky, 1975

(In millions of board feet)^a

Species	All classes	Standard-lumber logs			
		Grade 1	Grade 2	Grade 3	Grade 4 ^b
Softwoods					
Hard pines	147.9	12.3	11.3	124.3	—
Other softwoods ^c	70.6	—	—	—	—
Total softwoods	218.5	12.3	11.3	124.3	—
Hardwoods					
Select white oaks	427.8	42.7	75.2	219.1	90.8
Select red oaks	352.9	75.4	64.2	142.3	71.0
Other white oaks	640.3	116.6	93.8	284.1	145.8
Other red oaks	921.7	192.1	141.6	399.5	188.5
Red maple	148.0	12.2	34.9	56.9	44.0
Sugar maple	131.9	19.1	9.7	58.8	44.3
Hickory	640.7	105.9	130.7	325.7	78.4
Beech	549.2	8.3	19.9	356.2	164.8
Ash	46.6	—	18.9	18.1	9.6
Black walnut	21.2	3.1	1.5	13.9	2.7
Sweetgum	4.7	—	3.1	1.1	.5
Yellow-poplar	566.3	31.9	73.5	227.0	233.9
Blackgum	127.7	34.0	33.3	46.6	13.8
Basswood	132.9	14.4	10.4	99.8	8.3
Other hardwoods	183.2	27.9	26.6	98.4	30.3
Total hardwoods	4,895.1	683.6	737.3	2,347.5	1,126.7
Hardwood quality (%)	100	14	15	48	23

^a International ¼-inch rule.

^b This applies only to hardwoods and is construction grade material.

^c Species other than pine are not graded into standard lumber grades.

Table 72.—Annual net growth and removals of growing stock and sawtimber on commercial forest land in Kentucky, by geographic unit, 1974

Geographic unit	Growing stock		Sawtimber	
	Annual net growth	Annual removals	Annual net growth	Annual removals
	<i>Thousand cubic feet</i>		<i>Thousand board feet^a</i>	
Western	27,461	17,001	78,497	53,205
Western Coalfield	77,073	41,776	203,778	127,943
Pennyroyal	80,113	27,980	221,977	92,782
Bluegrass	26,887	8,437	62,229	15,300
Northern Cumberland	61,264	19,215	127,378	63,281
Southern Cumberland	60,288	25,828	123,492	77,974
Eastern	58,314	8,663	135,649	32,515
Total	391,400	148,900	953,000	463,000

^a International 1/4-inch rule.

Table 73.—Land area in Kentucky, by land class, county, and geographic unit, 1975

Geographic unit and county	Total land area ^a	Nonforest land area	Forest land	
			Non commercial ^b	Commercial
	<i>Thousand acres</i>			<i>Percent</i>
Ballard	165.9	121.4	1.4	26
Calloway	245.8	166.2	—	32
Carlisle	125.1	93.2	1.1	25
Fulton	129.9	103.6	—	20
Graves	358.3	276.0	—	23
Hickman	157.5	122.1	.3	22
Livingston	199.5	120.4	—	40
Lyon	161.8	80.9	—	50
McCracken	159.7	121.0	.2	24
Marshall	193.7	125.2	2.4	34
Trigg	293.6	149.8	1.5	48
Western Unit	2,190.8	1,479.8	6.9	32
Allen	232.9	139.5	.7	40
Barren	311.0	241.5	2.1	22
Butler	283.4	135.8	—	52
Caldwell	228.4	140.1	—	39
Christian	464.1	293.9	.6	37
Crittenden	233.3	140.7	—	40
Daviess	295.6	239.6	.6	19
Edmonson	194.6	79.2	44.8	36
Henderson	277.1	222.8	1.6	19
Hopkins	353.8	200.1	2.1	43
Logan	360.1	244.5	.1	32
McLean	164.5	123.1	—	25
Monroe	213.7	120.8	.1	43
Muhlenberg	307.5	172.4	1.0	44
Ohio	381.2	186.2	—	51
Simpson	152.9	129.8	—	15
Todd	240.3	165.8	—	31
Union	217.9	183.9	—	16
Warren	349.4	261.6	.2	25
Webster	216.8	157.9	—	27
Western Coalfield Unit	5,478.5	3,579.2	53.9	34

CONTINUED

Table 73.—Continued

Geographic unit and county	Total land area ^a	Nonforest land area	Forest land		
			Non commercial ^b	Commercial	
----- Thousand acres -----			----- Percent -----		
Anderson	131.8	86.7	0.2	44.9	34
Bath	183.7	125.4	—	58.3	32
Boone	159.6	110.2	.2	49.2	31
Bourbon	192.0	181.7	—	10.3	5
Boyle	117.3	96.3	—	21.0	18
Bracken	130.4	84.3	—	46.1	35
Campbell	95.4	66.9	.2	28.3	30
Carroll	83.5	45.8	.6	37.1	44
Clark	165.8	143.7	—	22.1	13
Fayette	179.3	170.1	.3	8.9	5
Fleming	224.0	151.1	—	72.9	33
Franklin	135.0	95.4	—	39.6	29
Gallatin	63.8	36.2	—	27.6	43
Garrard	151.3	124.4	—	26.9	18
Grant	159.2	104.7	.3	54.2	34
Harrison	197.1	158.8	—	38.3	19
Henry	185.0	138.5	.4	46.1	25
Jefferson	239.8	203.3	3.1	33.4	14
Jessamine	113.4	98.1	—	15.3	13
Kenton	105.7	73.6	.4	31.7	30
Lincoln	217.6	168.2	—	49.4	23
Madison	285.2	210.3	.7	74.2	26
Mason	152.1	125.5	—	26.6	17
Mercer	163.6	143.3	—	20.3	12
Montgomery	130.6	102.9	—	27.7	21
Nicholas	130.6	103.6	—	27.0	21
Oldham	117.4	91.5	—	25.9	22
Owen	224.6	131.2	—	93.4	42
Pendleton	178.6	118.8	.7	59.1	33
Robertson	64.6	43.9	.1	20.6	32
Scott	181.8	150.7	—	31.1	17
Shelby	245.1	200.2	.2	44.7	18
Spencer	123.5	95.3	—	28.2	23
Trimble	93.5	51.3	—	42.2	45
Washington	196.4	161.8	—	34.6	18
Woodford	123.5	110.6	—	12.9	10
Bluegrass Unit	5,641.8	4,304.3	.74	1,330.1	24
Adair	251.5	128.6	13.1	109.8	44
Breckenridge	361.2	203.8	4.9	152.5	42
Bullitt	192.0	87.6	.6	103.8	54
Casey	278.5	127.4	.8	150.3	54
Clinton	121.3	55.0	2.5	63.8	53
Cumberland	198.2	67.0	2.0	129.2	65
Grayson	327.5	177.3	4.7	145.5	44
Green	180.5	119.4	.2	60.9	34
Hancock	119.7	55.6	.5	63.6	53
Hardin	394.3	251.9	.7	141.7	36
Hart	272.0	154.9	6.4	110.7	41
Larue	166.4	105.7	.4	60.3	36
Marion	219.5	146.7	.5	72.3	33
Meade	195.3	112.3	2.4	80.6	41
Metcalfe	189.4	105.0	.4	84.0	44
Nelson	279.6	181.1	.7	97.8	35
Pulaski	418.2	217.4	8.6	192.2	46
Russell	152.5	75.5	13.4	63.6	42
Taylor	181.4	108.5	13.0	59.9	33
Wayne	281.7	89.3	5.8	186.6	66
Pennyroyal	4,780.7	2,570.0	81.6	2,129.1	45

CONTINUED

Table 73.—Continued

Geographic unit and county	Total land area ^a	Nonforest land area	Forest land		Percent
			Non commercial ^b	Commercial	
			<i>Thousand acres</i>		
Boyd	102.1	41.3	0.1	60.7	59
Carter	257.4	69.5	6.7	181.2	70
Elliott	153.6	38.7	3.3	111.6	73
Greenup	224.3	66.3	3.6	154.4	69
Johnson	169.0	33.4	—	135.6	80
Lawrence	272.0	54.1	—	217.9	80
Lewis	311.3	79.8	—	231.5	74
Magoffin	193.9	30.6	—	163.3	84
Menifee	134.4	28.0	9.0	97.4	72
Morgan	236.2	63.8	—	172.4	73
Powell	110.7	26.3	5.1	79.3	72
Rowan	185.6	43.7	—	141.9	76
Wolfe	145.4	31.2	13.0	101.2	70
Northern Cumberland Unit	2,495.9	606.7	40.8	1,848.4	74
Bell	236.7	34.9	13.4	188.4	80
Breathitt	316.2	38.8	—	277.4	88
Clay	303.4	52.2	—	251.2	83
Estill	166.4	51.2	—	115.2	69
Jackson	215.7	62.0	—	153.7	71
Knox	238.7	54.2	—	184.5	77
Laurel	285.2	104.0	1.1	180.1	63
Lee	134.4	24.5	—	109.9	82
McCreary	267.4	30.5	10.4	226.5	85
Owsley	126.1	20.8	—	105.3	84
Rockcastle	199.0	63.7	—	135.3	68
Whitley	293.4	63.7	.5	229.2	78
Southern Cumberland Unit	2,782.6	600.5	25.4	2,156.7	78
Floyd	255.5	39.0	5.3	211.2	83
Harlan	300.0	23.5	8.3	268.2	89
Knott	227.9	19.5	4.7	203.7	89
Leslie	263.7	12.7	4.3	246.7	94
Letcher	217.0	19.3	3.2	194.5	90
Martin	147.8	16.0	1.9	129.9	88
Perry	219.6	18.6	8.8	192.2	88
Pike	503.0	54.9	6.4	441.7	88
Eastern Unit	2,134.5	203.5	42.9	1,888.1	88
State total	25,504.8	13,344.0	258.9	11,901.9	47

^a Source: Area Measurement Report, Bureau of the Census, Areas of Kentucky, 1960 (July 1964).

^b Includes unproductive and productive-reserved forest land.

Table 74.—Net volume of growing stock and sawtimber on commercial forest land by county and geographic unit, Kentucky, 1975

Geographic unit and county	Growing stock	Sampling error	Saw-timber	Sampling error
	<i>Million cubic feet</i>	<i>Percent</i>	<i>Million board feet^a</i>	<i>Percent</i>
Ballard	46.5	22	109.8	28
Calloway	95.1	16	230.6	21
Carlisle	34.9	25	81.4	32
Fulton	31.1	28	78.4	37
Graves	78.6	18	180.4	25
Hickman	43.7	23	111.2	31
Livingston	99.5	15	243.0	20
Lyon	103.5	15	246.9	20
McCracken	38.3	26	92.5	35
Marshall	71.3	18	168.2	24
Trigg	178.4	11	433.2	15
Western Unit	820.9	3.1	1,975.6	4.2
Allen	107.1	18	266.7	27
Barren	71.5	22	175.1	31
Butler	162.5	14	390.8	22
Caldwell	87.6	20	203.6	29
Christian	188.3	14	455.1	20
Crittenden	92.2	20	216.9	29
Daviess	48.4	29	114.3	42
Edmonson	73.2	23	177.7	34
Henderson	50.1	27	116.1	40
Hopkins	153.2	15	368.0	23
Logan	134.6	17	332.3	24
McLean	38.1	31	90.4	41
Monroe	102.1	19	246.7	28
Muhlenberg	131.1	17	308.4	25
Ohio	204.4	13	487.9	19
Simpson	25.8	35	63.8	49
Todd	81.2	22	192.9	33
Union	35.1	28	84.0	38
Warren	93.3	20	224.5	28
Webster	57.8	27	138.1	38
Western Coalfield Unit	1,937.6	2.4	4,653.3	3.3
Adair	112.6	18	280.7	26
Breckenridge	149.0	14	370.7	20
Bullitt	106.1	17	266.0	25
Casey	167.4	13	426.6	19
Clinton	66.5	19	166.3	27
Cumberland	138.1	14	346.7	21
Grayson	142.0	15	351.1	22
Green	63.3	20	161.0	29
Hancock	64.5	21	159.2	31
Hardin	133.2	17	331.1	24
Hart	107.5	18	264.7	26
Larue	63.9	23	161.5	33
Marion	70.7	21	173.6	31
Meade	79.0	21	194.6	31
Metcalfe	91.1	18	232.6	26
Nelson	97.6	19	242.2	27
Pulaski	190.0	13	465.9	19
Russell	68.7	19	172.9	28
Taylor	63.4	21	160.1	29
Wayne	195.7	12	485.7	17
Pennyroyal Unit	2,170.3	2.0	5,413.2	2.6
Anderson	17.7	37	37.0	57
Bath	28.6	28	65.7	46
Boone	20.4	34	42.9	53
Bourbon	4.1	28	8.9	31
Boyle	10.9	43	25.7	62
Bracken	16.8	43	34.6	66
Campbell	12.0	43	26.2	64
Carroll	18.6	30	43.2	47
Clark	9.1	45	20.2	68
Fayette	3.9	30	9.3	33
Fleming	43.3	23	106.7	40
Franklin	14.8	49	29.6	78
Gallatin	12.5	45	27.2	69
Garrard	13.3	35	30.9	55

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Table 74.—Continued

Geographic unit and county	Growing stock stock	Sampling error	Saw-timber	Sampling error
	<i>Million cubic feet</i>	<i>Percent</i>	<i>Million board feet^a</i>	<i>Percent</i>
Grant	15.9	39	29.1	62
Harrison	13.4	44	26.2	65
Henry	18.1	39	37.3	59
Jefferson	14.1	37	30.8	71
Jessamine	7.4	24	17.1	36
Kenton	13.3	41	28.3	61
Lincoln	25.7	30	60.4	47
Madison	32.4	33	72.3	50
Mason	12.5	40	28.3	59
Mercer	7.7	42	15.8	61
Montgomery	13.7	41	32.0	62
Nicholas	10.7	52	22.3	80
Oldham	11.2	37	24.8	53
Owen	48.5	22	114.1	36
Pendleton	19.7	41	37.6	66
Robertson	7.0	45	13.7	69
Scott	13.5	40	29.3	60
Shelby	18.1	37	38.0	54
Spencer	10.7	50	21.8	79
Trimble	18.8	36	41.0	54
Washington	17.1	36	39.8	56
Woodford	5.6	39	12.1	57
Bluegrass Unit	581.1	3.1	1,280.2	4.2
Boyd	54.6	22	111.5	35
Carter	184.4	11	391.9	17
Elliott	126.4	14	279.3	21
Greenup	164.3	13	349.8	19
Johnson	134.9	13	276.6	20
Lawrence	212.9	11	433.3	17
Lewis	273.1	9	624.1	13
Magoffin	166.1	11	340.9	18
Menifee	108.4	14	236.1	21
Morgan	171.4	12	349.1	18
Powell	92.5	15	206.5	22
Rowan	167.4	12	378.6	17
Wolfe	115.5	14	254.8	21
Northern Cumberland Unit	1,971.9	2.0	4,232.5	2.9
Bell	168.4	13	380.2	17
Breathitt	259.6	11	598.0	14
Clay	241.3	11	566.0	14
Estill	114.7	17	265.4	22
Jackson	157.5	13	375.1	17
Knox	169.4	12	385.9	16
Laurel	193.0	14	455.8	17
Lee	116.4	15	271.7	19
McCreary	231.0	11	544.1	14
Owsley	101.0	16	237.4	21
Rockcastle	130.6	15	298.9	19
Whitley	218.7	12	505.0	15
Southern Cumberland Unit	2,101.6	1.8	4,883.5	2.3
Floyd	204.2	13	558.3	17
Harlan	272.5	15	758.4	20
Knott	197.8	17	543.0	23
Leslie	246.3	9	679.9	12
Letcher	192.6	13	529.9	18
Martin	129.4	19	356.4	25
Perry	189.8	12	520.7	16
Pike	427.7	11	1,167.0	15
Eastern Unit	1,860.3	4.4	5,113.6	5.9
State total	11,443.7	1.0	27,551.9	1.5

^a International 1/4-inch rule.

Headquarters of the Northeastern Forest Experiment Station are in Broomall, Pa. Field laboratories and research units are maintained at:

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 - Burlington, Vermont, in cooperation with the University of Vermont.
 - Delaware, Ohio.
 - Durham, New Hampshire, in cooperation with the University of New Hampshire.
 - Hamden, Connecticut, in cooperation with Yale University.
 - Kingston, Pennsylvania.
 - Morgantown, West Virginia, in cooperation with West Virginia University, Morgantown.
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 - Parsons, West Virginia.
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